# The American

# GAS LIGHT JOURNAL.

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(ILLUSTRATED.)

DEVOTED TO THE INTERESTS OF

## ILLUMINATION, HEATING, MECHANICAL, CHEMICAL

AND

## GENERAL SCIENCE.

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(FORTY-SEVENTH YEAR.)

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Address of Welcome to the Grand Lodge of Pennsylvania ..... 1
Response to Address of Welcome ..... 2
Annual Address of the Grand Master ..... 3
Report of the Committee on Foreign Correspondence ..... 4
Report of the Committee on Jurisprudence ..... 5
Report of the Committee on Finance ..... 6
Report of the Committee on Charity ..... 7
Report of the Committee on Correspondence ..... 8
Report of the Committee on Library ..... 9
Report of the Committee on Publication ..... 10
Report of the Committee on Appeals ..... 11
Report of the Committee on Grievances ..... 12
Report of the Committee on Work and Lectures ..... 13
Report of the Committee on Returns ..... 14
Report of the Committee on Credentials ..... 15
Report of the Committee on Foreign Relief ..... 16
Report of the Committee on Masonic Education ..... 17
Report of the Committee on Masonic Temples ..... 18
Report of the Committee on Masonic Relief ..... 19
Report of the Committee on Masonic Jurisprudence ..... 20
Report of the Committee on Masonic Publications ..... 21
Report of the Committee on Masonic Libraries ..... 22
Report of the Committee on Masonic Museums ..... 23
Report of the Committee on Masonic Archives ..... 24
Report of the Committee on Masonic Statistics ..... 25
Report of the Committee on Masonic Correspondence ..... 26
Report of the Committee on Masonic Foreign Relations ..... 27
Report of the Committee on Masonic Home ..... 28
Report of the Committee on Masonic Orphans ..... 29
Report of the Committee on Masonic Widows ..... 30
Report of the Committee on Masonic Aged ..... 31
Report of the Committee on Masonic Sick ..... 32
Report of the Committee on Masonic Distressed ..... 33
Report of the Committee on Masonic Deceased ..... 34
Report of the Committee on Masonic Memorials ..... 35
Report of the Committee on Masonic Monuments ..... 36
Report of the Committee on Masonic Cemeteries ..... 37
Report of the Committee on Masonic Burial ..... 38
Report of the Committee on Masonic Funeral ..... 39
Report of the Committee on Masonic Mourning ..... 40
Report of the Committee on Masonic Resolutions ..... 41
Report of the Committee on Masonic Thanks ..... 42
Report of the Committee on Masonic Miscellaneous ..... 43
Report of the Committee on Masonic Unfinished Business ..... 44
Report of the Committee on Masonic New Business ..... 45
Report of the Committee on Masonic Adjournment ..... 46

# THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

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**Correspondence.**—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

*The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.*


## CONTENTS.

An Asterisk (*) denotes an illustrated article.


OFFICIAL NOTICES—
- Respecting the Official Work of the American Gas Light Association..... 1
- Wrinkle Department, Ohio Gas Light Association..... 1
- Bureau of Information, Ohio Gas Light Association..... 1

EDITORIALS—
- Briefly Told..... 2
  Death of Mr. Gordon W. Lloyd—Notes.
- An Institution of Gas Works' Contractors and Manufacturers..... 2
- The Lighting of New York..... 4
- Preheating the Primary Air in Producer Firing of Retorts..... 4
- The American Diesel Engine, by Mr. E. D. Meier..... 6
- *A Feature of the Mueller Manufacturing Company's Exhibit at the St. Louis World's Fair..... 6
- *The Testing of Incandescent Burners and Mantles, by Mr. Victor A. Rettich..... 7
- The Graham-Morton Company's Show at the International Gas Exhibition..... 8
- Chemistry in the Foundry, by Dr. R. Moldenke..... 9
- Coaling at Sea, by Mr. F. C. Ferguson..... 10
- Illuminating Gas from Coke Ovens in England..... 11

SPECIAL ENGLISH CORRESPONDENCE..... 11
A Gas Engineer's Paradise—The Triumph of Welsbach—Some Other Developments.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 12
The New Britain (Conn.) Company to Extend Its Service—Cheaper Gas for the Long Branch (N. J.) District—New Collection Plan, Springfield, Mass.—Mr. Thos. F. Holden Out of "Restraint"—Something from Wilmington, N. C.—Some Personal Remembrance—Hints from New Brunswick, N. J.—The Gas Companies Employees' Mutual Aid Association—Hearing on the Petition of the Cambridge (Mass.) Company—How a Word Contest at Denver Ended—Changes in Clarksville, Tenn.—And Many Other Items.

The Market for Gas Securities..... 14


[OFFICIAL NOTICE.]

### Respecting the Official Work of the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION,
SECRETARY'S OFFICE,
530 Broadway, N. Y., Dec. 13, 1904.

To the Members American Gas Light Association: As there seems to be some misunderstanding respecting the standing of the official management of the Association, members will please note that the undersigned is the Secretary of the Association, and that Mr. A. E. Forstall is carrying forward the work of the Practical Class. All correspondence in connection with the Practical Class should therefore be addressed to Mr. A. E. Forstall, 58 William street, and all other matter pertaining to the Association to MR. GEORGE G. RAMSDELL, Secretary, at the above address.

[OFFICIAL NOTICE.]

### Wrinkle Department, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF SECRETARY,
DELAWARE, O., Nov. 21, 1904.

The Editor of the Wrinkle Department, Mr. E. E. Eysenbach, General Manager of the Binghamton (N. Y) Gas Company, earnestly solicits the co-operation of the fraternity for contributions to be presented to the Twenty-first Annual Meeting of the Association, which is to be held at the Hotel Schenley, Pittsburg, Pa., March 15th, 16th and 17th, 1905.

Editor Eysenbach will be pleased to receive contributions not later than February 10th. Work for the good of the cause and send him your "Wrinkles."

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

### Bureau of Information, Ohio Gas Light Association.

CITY OF LINCOLN GAS CO.,
LINCOLN, ILLS., Oct. 10, 1904.

To the Fraternity: At the last meeting of the Ohio Gas Light Association a Bureau of Information was decided upon, the idea of which is to render assistance to members who may have questions coming up or difficulties arising respecting which they would like some help. This Bureau has been established and is now ready for business. A number of co-Editors have been appointed to whom the various questions will be referred. As this is the first Bureau of Information attempted by any Association, it is hoped that the members will take advantage of its opportunities. The co-Editors are as follows:

*Distribution.*—E. E. Eysenbach and M. E. Malone.
*Accounts and Bookkeeping.*—D. W. Low and Chas. Ritter.
*New Business and Gas Appliances.*—Frank D. Moses, Ralph Woodward and F. Cavanagh.
*Chemistry*—H. B. Harrop and Clarence Lomax.
*Retort House.*—Moses Coombs.
*Natural Gas.*—W. H. Hammon and Geo. W. Barnes.

All questions should be addressed to the Editor, at Lincoln, Ills.

Very truly [illegible]
H. L. OLDS, [illegible] Information Bureau.


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## BRIEFLY TOLD.

DEATH OF MR. GORDON W. LLOYD.—We are indebted to a correspondent in Detroit, Mich., writing under date of the 26th ult., for the following sad mention: "It is with sorrow I have to inform you of the death of Mr. Gordon W. Lloyd, who answered to the final summons, December 23d, in San Francisco. The immediate cause was heart failure and death was instant. He left Detroit, December 11th, accompanied by his son Alfred as far as New Orleans, to take the steamship "Ventura" at San Francisco for a trip to New Zealand, expecting to stay some time there and at Samoa and Honolulu. Although his family had no immediate apprehension of his death, and his general health was excellent, they nevertheless knew his tenure of life was very uncertain through a serious nervous affection of the heart, contracted about 8 years ago. This made it necessary for him to retire from all active business and to avoid the exertion of intercourse with all but a very few personal friends. He was a splendid sailor and had determined to enjoy whatever might be his future winters in long ocean voyages in warm climates, conscious that he would never suffer from any lengthened sickness. He was born in Cambridge, England, April 6th, 1832. His father, an officer in the Royal Navy, retired and settled with his family near Sherbrooke, Can., where he received most of his education. Through his father's death, the family returned to England. In 1858 he again came out and settled in Detroit, as a successful architect, until 1895. Detroit and other Western cities contain many examples of his work. He was an authority on classical and gothic architecture, to the latter of which he particularly leaned. His knowledge of painting and literature was probably equalled by very few; withal he severely shunned all publicity. His connection with the gas business dated from 1889, in which year he and other Detroit associates financed one of the then popular fuel gas attempts at Akron, O. This venture did not compete with the existing company, and not proving successful a friendly purchase of the latter was effected. The combined properties were later sold to Chicago parties. Through this connection he became interested in construction, and in 1890 joined in the organization of The Western Gas Construction Company, of Fort Wayne, Ind. This Company he financially backed until 1899, and in 1901, the opportunity offering, he disposed of his interests, and with his sons organized the Lloyd Construction Company, of which he was President. About 1899 he organized the Hillsdale City (Mich.) Gas Company, which he subsequently operated. Early in the present year he finally severed all active connection with business, his sons undertaking his affairs. He is survived by his wife, three sons, Ernest F., Arthur C. and Alfred G., and a daughter, Miss Agnes M. Lloyd."

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NOTES——

MR. O. W. GREENSLADE, Secretary of the Fred. Bredel Company, informs us that the annual meeting of the Company will be held in its offices, 405 Keene street, Milwaukee. Wis., at 2:39 P.M. of the 12th inst.

A CORRESPONDENT in Springfield, Mass., writing under date of December 28th, incloses the following: "The output of something over 500,000 cubic feet of gas last Saturday, from the municipal plant at Holyoke, Mass., is by far the largest in the records of the city, either when it was controlled by the Water Power Company or since it came under city control. This emphasizes the need of a new gasholder, and Manager Snow will undoubtedly enlarge upon this point in his annual report. The present gasholders have a capacity of about 250,000 cubic feet, so after the last was full it was necessary to run the gas plant at pretty near the highest notch to keep up with the demand. This is not economical work from a gas engineer's standpoint. If the Aldermen adopt the plan recommended last year by Manager Snow, a gasholder holding 850,000 cubic feet of gas will be built, which, with the present capacity, will make storage capacity of over 1,000,000 cubic feet. The minimum amount of storage considered by gas engineers to be safe is an amount equivalent to the capacity of the plant in 24 hours. The present plant's capacity is considered to be a little over 500,000 cubic feet in that time."

JUDGE JOHN D. FISH and other residents of Rockville, Conn., will petition the Legislature for the right to construct and operate a gas plant in Manchester, Conn.

ADVICES from Boston, dated December 29th, are to the effect that that afternoon the Common Council passed unanimously an order introduced by Councilman McDermott, providing for municipal gas and electric lighting plants to be operated on public account. The order will next come up for action before the Board of Aldermen at its final meeting for the year to be held Saturday. It is necessary that such an order pass the City Council two consecutive years and secure the approval of the Mayor before it is submitted to the people for action at the polls.

## An Institution of Gas Works Contractors and Manufacturers.

The *Journal of Gas Lighting*, in putting forth the above suggestion for consideration, remarks that the important position that the gas industry has attained in the country has been demonstrated time and again by numerous statistics; and it is now receiving at Earl's Court a vivid illustration of ripe development to a point from which it is setting out in the fullness of vigor to win fresh laurels in all fields in which it has made way through beneficent service to mankind. That service has through the years of existence, and especially so through those constituting the last quarter of a century, been moulded and directed by that safest and surest of all sciences in industrial progress—the science of economics. The service to the community has not been limited to the provision of cheap light, fuel and power, but it has extended to the provision of a remarkable opportunity for the profitable and secure investment of capital, and to the provision of a lucrative, and constant for the most part, employment of labor of many grades—so many and so well known to our special readers that they need not be enumerated.

It is, however, usual, in giving statistics referring to the gas industry, to confine them to the capital actually employed in the manufacture and distribution of gas, and in considering its labor to number only the workers engaged in such operations. This does not give in reality any fair measure of the gas industry as it should be broadly viewed. The gas industry so regarded is not an independent entity. It is surrounded on all sides by other industries on which it is itself dependent - industries which feed and contribute to its support, and which industries derive a benefit from their service in direct correspondence with the benefit realized by the gas industry. Within that outer ring of industries, there comes a section of the country's manufacturers and contractors, without whom what is generally known as the gas industry cannot exist, and who, on the other hand, have their very being in the existence of the gas industry. These are the specialists in gas manufacturing and distributing plant and in the appliances through and by which the gas made is utilized, and through and by which gas has been rendered what may be truly termed a necessity to the community. The work of those specialists in plant and appliance production has, we venture to think, had as much to do with the progress of the gas industry as the work of those who are specialists purely in the production of gas and in the administration of the business of gas supply. In other words, by their work, by their economical and serviceable productions they have assisted in creating the demand for gas which has built up the gas industry. Therefore, we prefer to regard the gas industry as embracing those in whose works are centered many of the roots of the big growth over which we are at the present time so greatly rejoicing. If the capital and labor engaged in these great contributory concerns could be computed the figures generally taken as representing the strength of the gas industry would receive a substantial addition.

In the foregoing, we have claimed certain things on behalf of gas manufactrers and contractors. First, we have claimed for them identity with the gas industry—a right to be regarded as an integrant of the industry. Secondly, they have taken an incalculable part in the development of the industry; and there is the ground of their right. Thirdly, that gas manufacturers and suppliers and gas plant and appliance manufacturers have an interdependence that no amount of argument or disregard can destroy. Fourthly, that respect is due to them as large employers of capital, skill and labor. Consideration of these points may win for them all tacit consent; we would fain see open recognition. But sufficient for the argument is the tacit consent. Admitting that the contractors and manufacturers of the gas industry have taken an active part in making the pace in the progress of the industry, the further admission must succeed that they have done this through inventive skill (in which engineering, science, and practical application are all intermingled), a keen conception of the requirements of the present and the future, an eager willingness and desire to meet those requirements in the best possible way to their own profit and the profit of the gas industry, with the whole enveloped in business acumen and capacity. "There is however, a pronounced line of demarcation between us and the gas industry as represented by those engaged in the manufacture and supply of gas, and that line has been ruled not by us. We feel and we recognize it." That is the plaint that has fallen on our ears on many occasions from many individuals. The line, however, is not so pronounced as those feel who lament its existence. "We are," it is also said, "regarded as inferior beings by those over the other side of the line." It is our desire at the present time to suppress that feeling; and it will be the desire of all on the "other side of the line," if such exists, to suppress it too. Verily, it would have been a bad

thing for the gas industry if there had been on the one side of the supposed line all the best inventive faculty, the perspicacity, and the business capacity, with nothing but the inferior on the other. But is there—look at the matter broadly in the face—less of all the essentials to the building up of a strong industry on the gas contractors and manufacturers' side of the hypothetical line than on the other? Not a whit less. In their ranks are men of whom all are proud; and from their engineering shops and works have come men who have made their mark in the realm of gas manufacture and supply. The overlapping of the sections of the gas industry is extensive and secure; and, being so, no line of such a character as has been so frequently suggested can be said to exist in fact.

Now we come to the point; and it may be said that we are treading on dangerous ground. We refuse, in view of what has already been stated, to recognize the danger. The great exhibition at Earl's Court has been impressive on many points; but not the least of them has been the hearty, and not only hearty but generous, manner in which the gas contractors and manufacturers have come forward to illustrate the might of the gas industry. Could a more substantial proof of a community of interest between gas plant contractors and appliance manufacturers and gas makers and suppliers be needed than this exhibition? We think not. In the increasing demand for gas, in all plans for cultivating that increase, the former have their prosperity with the latter. While the exhibition has demonstrated all this, and left no room for contradiction, there is another thing that has been impressed with equal force; and it is that the gas works contractors and appliance mauufacturers of this country intermingled in interest yet having a distinct sphere in the gas industry are in an utter state of disorganization. There are floating units neccessary to a body, possessing all the constituent parts neccesary to an active, useful body, and yet without a body. In other words they have no representative, central organization which can speak and act with authority, and form mutually beneficial alliances with kindred institutions, and no means of cultivating, through technical and social ways, the honorable aspirations of most men to have communion with fellows having identical interests. Hands may be held up in pious horror, and the ugly word "ring" may be whispered. The idea has nothing of the kind within it; and the slightest intimation of such a thing would alienate the sympathies of several of the leading manufacturers, and put an immediate end to any operations detrimental to the gas industry as a whole. Competition is too great in the gas industry to ever permit the continuance of any such thing. Rings where there is great competition are bound to be ephemeral. That is a point that can be dismissed without raising the slightest anxiety, and more especially seeing that protection against such a thing could be specifically legislated for in the rules of the new Institution.

Let us seriously consider the matter, and first of all emphasize the point as to unity of interests among the contractors and manufacturers, and yet a disunited existence, by reference to the present exhibition. There we have unity of interests typified in all its strength; but in realizing that illustration, what an amount of labor has been involved through chaos and disorganization—through the contracting and manufacturing section of the industry consisting of a great number of separate units without bond of any kind. The Institution of Gas Engineers said in effect: "We will have an exhibition," and forthwith they had to go to every gas plant and appliance manufacturer and contractor to obtain his attachment to the project. The whole thing, though involving so much trouble and expense, might have been a failure. How much easier, how much better, how much more dignified would it have been if the contractors and manufacturers had been in corporate existence, with a Council of representative men at their head, to whom the Council of the Institution of Gas Engineers could have gone and said, "Will you co operate with us in organizing an exhibition?" and then have proceeded to act jointly in the matter throughout.

It is, as we have said, a natural thing for men to organize for the advancement not only of themselves but of the profession, industry or line of commerce with which they are associated. In every professional, industrial and commercial walk of life it is so. The gas profession have their national organization, and with considerable benefit their district societies. Secretaries and accountants have theirs. The same with all other professions. Look where one will, too, among the industries—other than in the contracting and manufacturing section of the gas industry—and it is found that they have their technical and commercial and representative organizations. The old question need not be discussed here as to why the contractors and manufacturers should not be part and parcel of the Institution of Gas Engineers. The interests of the members of that organization are manifold, in many of which interests the contractors and manufacturers have no concern. The interests of contractors and manufacturers are, as a matter of fact, largely of a specialized order; and, therefore, about the bulk of the matters which engage the gas profession, many of them have not the remotest care. There is, however, overhanging all division of interest, the one great common interest in the prosperity and advancement of the industry. There is no conflict of interests on that point; and the contractors and manufacturers have proved it, and their fidelity to the industry, by this present exhibition. We have heard a great deal about affiliation and unity of late in the gas industry; and why should there not be unity in its contracting and manufacturing section?

Now what would be the advantages of such an organization? That is a question that will be better answered after several minds have been brought to bear on the subject. But a few points occur off-hand. In the first place, at the present time, the contractors and manufacturers are not—and cannot be because the want of an organization of standing which can be approached—taken so fully into the counsels of the gas industry as they might otherwise be.

We can quite imagine such a thing as this happening—the interchange between the Councils of the respective institutions of suggestions for discussion at the annual meetings; and the invitation of one Council to the other to select members from their respective bodies to attend meetings when subjects upon which those members were specially qualified and competent to speak were being introduced for consideration. The Institution of Gas Engineers, in short, would be the better able to act in collaboration and conference with gas contractors and manufacturers as an organized body than they can now do with individual firms and companies. And, of course, the same holds good on the other side. Their Institution would give to gas contractors and manufacturers a status which they do not at present possess. Annual meetings could be held at which the President of the Institution could deal with commercial questions and problems of interest to the general body of the members. Subjects of both common and sectional interest could be introduced for discussion through the medium of papers or orally.

There is the social side, too. We spoke only last week in the *Journal* about the good fellowship that exists among the representatives of the exhibitors at Earl's Court. Only this last week, again, at the exhibition the chief of an exhibiting firm said that he had met one of the principals of a competing firm for the first time that day; and he was pleased that he had had that opportunity of making his acquaintance. He added: "If he succeeds in getting a contract in future for which I am competing, I shall be better pleased than I may have been in the past, now that I know what a good sort of fellow he is." These two men had been competing for years, and they had never met until this exhibition. Why was this? Simply because there had not been the opportunity. The meeting and introduction had altered their feeling one towards the other; and an Institution would tend to promote this friendly spirit and comradeship. Opportunities would also be given for the exchange of courtesies and evidences of friendship between one section of the gas industry and the other, which could be done and accepted through an organized body, where the suggestion would be objectionable from individual firms. It would, however, be an indispensable condition, in order to insure the necessary status, that the Council of the new Institution should be composed of principals or directors, representative of the whole range of contractors and manufacturers.

The suggestion is open for discussion. It is put forward as a means of dispelling the feeling which now so generally exists that gas works' contractors and manufacturers are of the gas industry, and yet have no recognized position in it. An Institution of their own, with a President and Council drawn as suggested above from principals and directors, would give them the honorable standing they desire, and to which they are entitled. The suggestion comes at an opportune time. There is in existence a Committee of Exhibitors at Earl's Court, with Mr. C. Clare as their Chairman. We cannot do better, having given the question this start, than suggest that Mr. Clare should call a meeting of that Committee for the private discussion of this matter, and then communicate the result and resolutions for publication in our columns. If the matter does not come to anything, we shall at least have the satisfaction of having put forward, in crude form it may be, but with good intent, a proposal which we believe is the one solution of a difficult problem—that solution is the bringing into existence of a corporate body, consisting of gas works' contractors and manufacturers whose aims and interests would be to unitedly, as well as individually, do their part in aiding in the progress of the industry of which they constitute an important part, and in encouraging and maintaining a good tone in the commercial life of that industry.

## The Lighting of New York.

Mr. Homer G. Parsons, writing in the New York *Sun*, December 26th, has this fair comment to make respecting the lighting of New York: When Lord Kelvin was in New York some time ago he spoke of this as the best lighted city in the world.

Is not some of the credit for that condition due to the men wao have developed our lighting companies? Instead we hear indiscriminate abuse of them because of their bills for lighting, as if they were simply robbers of the public, and now the Citizens' Union proposes to work for a lighting plant under municipal control.

Much is printed about the efficacy of municipal ownership of public utilities in Great Britain. The plan is said to work perfectly in England and Scotland, so that it is taking a firmer hold every day. But what are the facts?

In the past two years there have been several important and significant sales of gas plants by municipalities and townships to private companies in both England and Scotland, and there is a distinct tendency in those countries to encourage the American idea of corporation or company enterprise, as may be ascertained if one follows the reports of the British trade journals devoted to the subject. Moreover municipal ownership in Great Britain is not what it was a few years ago—in 1896—when Governor Altgeld, of Illinois, came home from abroad with the hope that it would be made an American institution.

In a speech at Washington Park, N. J., Mr. Altgeld extolled the management of the lighting plants in Bristol, Manchester and Glasgow. but he did not venture to say that any one of these cities was as well lighted as is the average American town. The comparison would have been manifestly absurd, and he had sense enough to avoid it and cling to the demagogic harangue that American civic progress should have none of the influence or enterprise of the individual.

Philadelphia made such an experiment, and a bitter and costly one it was. The commission bore the sobriquet of the "Gas Trust," just as the consolidation of our lighting companies is now called. It started out with the best of motives and purposes, with a definition of powers similar to the regulation of such commissions in Great Britain, but it was easy to fill the gas works with political servants. The nucleus of a powerful organization was thus created and in time it developed into a political tyranny for the city, The making of gas was more a matter of politics than of revenue to the city or satisfaction to the consumer. No attempt was made to improve the quality or cost of the gas or to adjust complaints of consumers. Payrolls were padded and the affairs of the gas houses otherwise manipulated so that a deficit at the end of the year was a regular thing, and councils, dominated by the commission, generally yielded to requests to help it out.

This was as recently as 1896, but Philadelphia finally rebelled and threw off the yoke of municipal ownership. In the long agitation that brought about the transfer of the gas works to a private corporation, in 1897, the Hon. John Wanamaker had a conspicuous part, and I dare say no other Philadelphian is better informed on the Quaker City's grievances against municipal management of a public utility. Former Mayor Warwick, who signed the ordinance effecting the transfer, told me recently that in his opinion the theory is absolutely un-American and that if he were Mayor of New York he would veto any measure which aimed to put any public utility under municipal control. I have talked with many Philadelphians on the subject and they all agree with Mr. Warwick's view.

I also made some inquiries among gas engineers in Philadelphia as to the quality of gas we now get in New York, its method of manufacture, distribution and cost. One well-known Philadelphia engineer said unhesitatingly that we get the finest and best illuminating gas that can be manufactured; also that we have such splendid facilities for manufacturing gas that gas engineers and manufacturers from all parts of the world come to New York to seek instruction as to the advancement of the industry.

From engineers in Boston and Philadelphia I have learned that we use what is technically termed carburetted water gas, also coal gas. Carburetted water gas is really what is generally consumed. No straight coal gas is distributed in New York. Coal gas falls short of the requirements of the law as to illuminating efficiency, and it is necessary to mix it with water gas to bring it up to the legal standard. Carburetted water gas is produced by passing superheated steam over carbon, generally anthracite coal. An enrichment process, naphtha or oil, is added to produce the illuminating power, and this process, engineers say, adds to the cost of manufacture. The cost of manufacture of gas in our cities is very much higher than abroad, for the candle power required in many European cities is so low that straight coal gas, which has practically been discarded here, will fill the bill. The law requires 20 candle power gas iu New York, the highest standard of illumination. The possible dangers in the use of water gas were carefully considered for several years by the engineers before they would give their sanction to the adoption of the gas, but the conclusion was reached that properly used water gas entails no more risk to the consumer than other kinds of illuminating gas, hence the general use of the gas in our cities. On this point I asked the views of chemists, one of whom was Dr. E. G. Love, chemist for the city of New York. Dr. Love told me that the percentage of monoxide or carbonic oxide in the gas we get runs from 18 to 25, which he said is not excessive, and that the gas does not menace the health of the consumer if properly used. Gas men have not yet been able to find a gas giving better results with less hazard than carburetted water gas.

Before we take the advice of the Citizens' Union to put our lighting utilities under municipal control, find out why Cleveland refused to adopt it by popular vote, and what it means to the little city of Wheeling, now laboring under its disadvantages. How would such a department of the public service work in a city where party strife and factional ambition are so keen as in New York? How long would our local political organizations be content with a municipal lighting plant without getting a whack at spoils which conditions have kept from their reach for many years?

Compared with Philadelphia and other large cities prices charged for gas and electricity in New York are reasonable—at any rate, we are no more at the mercy of gas companies than they are. Moreover, the fact remains, as Lord Kelvin said, that New York has now a system of gas and electric illumination which makes it the best lighted city in the world.

## Preheating the Primary Air in Producer Firing of Retorts.

The *Gas World* reports that an animated discussion has been going on in the *Journal für Gasbeleuchtung*, in which Herr Göhrum, Dr. Bunte, Herr Hudler, and again Herr Göhrum and Dr. Bunte have taken part.

Herr Göhrum, having observed the apparent paradox involved in preheating the primary air used in the producers in retort settings, and at the same time driving up the steam supply so as to prevent overheating and slagging and to promote granulation of the ash, applied himself to calculate what the real effect of this apparently self-destructive course of procedure was. As the basis of his calculations he took a bench of 9 retorts, with charges of 170 kg. (374 pounds) and 5-hour periods of distillation. In all 7,140 kg. coal would be charged during 24 hours; and for this, at 15 per cent., 1,071 kg. of coke would be consumed, or, allowing for ash, in round numbers 1,000 kg. of carbon per day. Then, taking the heat value of carbon burned to CO as 2,473 kg. C heat units per kg., of CO burned to $CO_2$ as 2,403, of H burned to $H_2O$ as 28,800, and the specific heats of air, N, H, and CO as 0.31, of $CO_2$ as 0.43 and of $H_2O$ vapor as 0.39, Herr Göhrum embarks on long calculations, of which the results are summarized in the following table. In this table it will be notieed that it is assumed that no heat units are wasted by radiation, etc., that the air supplies are exact, being neither too much nor too little, that there is no leakage, and that all the material is assumed to start ice cold unless it is preheated; and, further, that no reference is made to preheating the secondary air, Herr Göhrum's purpose not being to deul with this question.

The maximum temperatures set down could never be attained in practice; but the calculations enable the effects of the three types of treatment to be compared. The first gives the highest theoretical temperature; but the producer gets very hot, and in practice there is much incidental waste of heat by radiation, etc., while the slag cannot be readily induced to flow away freely. Of the two that remain the third is the better, being equally cool in the producer and hotter at the retorts. The conclusions reached by Herr Göhrum are (1) that the amount of steam used ought only to be so much as is requisite in order to keep the ash in a condition in which it can be easily removed; (2) that the primary air ought to be preheated; and (3) that the heat carried in by the preheated air does not go to heat up the producer, but is first absorbed in making water gas and then recovered when this is burned under the retorts—not, however, completely recovered as a means of producing high temperatures, for its tendency in that direction is partly neutralized by the corresponding slight increase in the quantity of the products of combustion, due to the increase in the quantity of steam admitted.

*Dr. Bunte's Views.*—Dr. Bunte was impressed by Herr Göhrum having left altogether out of account the effect of heating the secondary

| | Pure Producer Gas, No Steam; Liegel's Firing (Slag run off Fused). No Preheating. | Steam Used. Primary Air Not Preheated. | Primary Air Preheated to 500° C.; More Steam Used in Order to Prevent Slagging. |
|---|---|---|---|
| *Primary Gas Production—* | | | |
| Materials used, carbon, kilogrammes | 1,000 | 1,000 | 1,000 |
| steam " | .... | 420 | 567 |
| " cubic meters | .... | 519 | 701 |
| primary air " | 4,473 | 3,225.6 | 2,789 |
| Gas produced, car. oxide, cubic meters | 1,864 | 1,864 | 1,864 |
| hydrogen " | .... | 519 | 701 |
| nitrogen " | 3,541 | 2,554 | 2,207 |
| Total | 5,405 | 4,937 | 4,772 |
| *Secondary Combustion—* | | | |
| Secondary air used, cubic meters | 4,473 | 5.7204 | 6,157 |
| Total of primary and secondary air " | 8,946 | 8,946 | 8,946 |
| Chimney gases, carbonic acid " | 1,864 | 1,864 | 1,864 |
| steam " | .... | 519 | 701 |
| nitrogen " | 7,082 | 7,082 | 7,082 |
| Total " | 8,946 | 9,465 | 9,647 |
| *Heat Unils* (kilogramme-centigrade)— | | | |
| In producer gas, heat of formation | 2,437,000 | 1,129,000 | 658,600 |
| " " " from preheating | .... | .... | 432,300 |
| In chimney gases, from secondary combustion only | 5,599,000 | 6,943,000 | 7,413,400 |
| Total heat units | 8,036,000 | 8,072,000 | 8,504,300 |
| *Maximum Theoretical Temperatures—* | | | |
| Of producer gas | 1,475° C. | 738° C. | 728 C. |
| Of the secondary combustion | 2,693° C. | 2,523 C | 2,600° C. |

air, which he thought wrong in principle. He had himself shown 24 years ago that the total volume of air required as primary and secondary air taken together was always the same, and the more steam was admitted the less air was required as primary and the more as secondary air supply; and that when no steam was used the primary and the secondary air supplies were theoretically equal, and the temperature of the secondary combvstion stood at its highest. Now taking Herr Göhrum's assumed data he very elaborately calculates the whole results, using a method of calculation based upon volumes and not upon weights. Running his computations somewhat more finely than Herr Göhrum, he reaches results summarized in the following table, of which the first, second and last columns correspond to the columns of the preceding table.

| | No Steam no Preheating of the Primary Air. | Steam 42 Per Cent. of the Co e by Weight. | | Steam 5`.7 Per Cent of the Coke; Primary Air Preheated to 500° C. |
|---|---|---|---|---|
| | | No Preheating of the Primary Air. | Primary Air Preheated to 500° C. | |
| *Maximum Theoretical Temperatures—* | | | | |
| Of producer gas | 1,449° C. | 696° C. | 1,021° C. | 686° C. |
| Of secondary combustion— | | | | |
| Secondary air supply, cold | 2,725° C. | 2,547° C. | 2,703° C. | 2,622° C. |
| " " " 1,000° C. | 3,188° C. | 3,096° C. | 3,251° C. | 3,205° C. |
| Ratio of primary and secondary air— | | | | |
| (Reduced to standard temperature and pressure)..... primary | 1.00 | 0.72 | 0.72 | 0.62 |
| (Reduced to standard temperature and pressure)..... secondary | 1.00 | 1 28 | 1.28 | 1.38 |

From these results Dr. Bunte concludes that when we properly heat up the secondary air supply there is no reason for being so economical with steam as Herr Göhrum (and also Herr Hudler, and Herr F. Fischer in his handbook) recommends. The more steam is used the greater is the benefit obtainable from preheating, for the greater is the proportion of the secondary air; and the inference would be that the steam should be run in until the preheating of the primary air is just able to cause the steam to become completely converted into water gas.

In practice the results are more favorable to steaming than the theoretical data would indicate, for in those it is assumed that there is no waste of heat, while steamless working in practice presents a maximum of such waste, by radiation, etc., from hot producers; and this cuts down the temperatures obtainable under the retorts, the more so the less steam there is used.

*Herr Hudler's Contentions.*—Herr Hudler next challenges Dr. Bunte's conclusions, and advocates the restriction of the quantity of steam used. He takes Dr. Bunte's figures and extends them, remarking that we ought only to compare cases where both the primary and the secondary air supplies are preheated; and with primary at 500° and secondary at 1,000° we get the following:

| | No Steam. | Steam 42 Per Cent. | Steam 56.7 Per Cent. | Steam 80 Per Cent. |
|---|---|---|---|---|
| Temperatures of secondary combustion | 3,420° C. | 3,257° C. | 3,205° C. | 3,131° C. |
| Ratios—Primary air | 1.00 | 0.72 | 0.62 | 0.47 |
| Secondary air | 1.00 | 1.28 | 1.38 | 1.53 |

From this we see that the less the steam the higher the temperatures (theoretical maxima), but practice is still more favorable to steamless working, in respect that it is not possible to heat the primary and secondary air supplies to 500° and 1,000° respectively without rearranging the plant to suit the particular ratio required. If the secondary air supply is increased it has to come more rapidly through a given regenerator setting, and is not as well heated, and if it falls off in this respect the advantage disappears and you are bound to cut down your steam. For practical purposes we cannot, however, work steamlessly, nd the question comes to be how near we can approach this limit. Herr Hudler's practical experience is decidedly in favor of restricting the steaming; the results are much better, in spite of possible greater losses of heat from the hotter producer. The difference is in fact surprising, and it is perhaps due to the available margin of heat being, by reason of losses of heat to the air, less than we would have anticipated, so that a small gain in heating power and in the corresponding temperature produced may have more importance than we would have reckoned upon.

*Herr Göhrum's Reply to Dr. Bunte.*—In the first place, Dr. Bunte has expanded the area of discussion, for the original aim was only to investigate the apparent paradox involved in both preheating the primary air and at the same time cooling down by steaming, and purposely to limit the investigation to that; especially since preheating the primary air only raises the temperature of secondary combustion by some 6.11 per cent. when the secondary air supply is cold, and by some 5.01 per cent. when it is at 1,000° C. (A. Schmidt's tables). Dr. Bunte's own figures show that we should be careful in the use of steam, for it causes a marked tendency to a drop in temperatures which even preheating may in some cases be barely able to combat; the reason, of course, being that the addition of steam increases the volume of final products, in which all the steam that is run in appears again as steam.

*Dr. Bunte's Final Observations.*—It is plain how needful discussion of this topic has been. No doubt, theoretically, steamless heating with high preheating of both the primary and the secondary air is the ideal, being the simplest and the best; unfortunately, however, it won't work, as Herr Hudler allows. It is not known to be in use anywhere, and it is needless to calculate its efficiency. The fact that the use of steam gets over the difficulties and enables producers to be worked steadily and regularly is the outcome of the work of Grahn, Schiele, and Schilling on behalf of the German Gas Association (*Journal für Gasbeleuchtung*, 1879, page 462). By this it was established that there was theoretically no gain, for the same amount of heat was absorbed in decomposing the steam as was afterwards obtained from the water gas produced; but that the producer was kept cooler and the heat which had been absorbed was carried forward, to be liberated at the point where it was required. It was at the same time perfectly clear that the addition of steam would increase the volume of the products of combustion, and correspondingly diminish the temperature of these and increase the loss of heat through chimney gases. So far Dr. Bunte entirely agrees with Herr Göhrum and Herr Hudler.

Herr Göhrum pointed out that preheating the primary air would at least partially neutralize the theoretical disadvantages of steam, but seemed to treat the preheating of the secondary air as non-essential. Dr. Bunte has tried to complete Herr Göhrum's exposition where it seemed inadequate, and to show that increasing quantities of steam enable increasing quantities of secondary air to be used, and that these being highly preheated may work up the temperatures materially. Naturally, the addition of steam will have some limit; you may add

more than can be decomposed, and the excess will act like an inert gas. Herr Hudler's 80 per cent. of steam, in the absence of preheating of the primary air, would theoretically make gas at 120° C., which means practically that it would blow the fire out, and the practical limit would seem to be somewhere about Herr Göhrum's 57.6 per cent. (with preheating of the primary air to 500° C.), beyond which the primary air would have to be heated to an extent which the firebars would not stand, or the temperature in the producer would fall below 700° C. Occasionally, of course, we do get larger proportions of steam run through without actually putting the fire out, but that is simply because they go through undecomposed as an inert gas. If we go somewhat beyond the limit of, say, 50 per cent. of steam, we do reduce the temperatures, and it is then a question of economical practice how far the advantage of granulating the slag compensates for the reduction in temperature, which in any event is not great within reasonable limits. The report of 1879 recommended 49 to 79 per cent. of steam, according to the different kinds of coke then obtainable. There is a good deal of scope for diversity of judgment as to this.

It is a pity if Herr Hudler has to do with plant which will not sufficiently heat up his air supply, but that does not affect the principle. The Munich plant does it beyond doubt (*Journal für Gasbeleuchtung*, 1882, p. 727 *et seq*). Herr Göhrum seems to think that preheating the primary air presents some advantages over preheating the secondary air. Surely not. Most likely it makes no difference at all by what path the requisite heat units find their way to the interior of the combustion chamber.

On the whole (Dr. Bunte observes), the disputants are not as much at variance as perhaps at first they seemed to be and the discussion is bound to be of benefit.

## The American Diesel Engine.

By Mr. E. D. Meier.

Many of your readers will remember certain papers published some years ago in regard to the merits of a new invention in prime movers, called the Diesel motor.

The claims set forth as to the economy of this device were so large and far reaching, that most practical men received them with a shrug of the shoulders. They were, nevertheless, not only true, but somewhat understated. From the small Diesel motor of 20-horse power, which gave these remarkable results, has grown by natural process of evolution the American Diesel engine of to-day, at present built in sizes from 75-horse power to 450-horse power.

A short explanation of the working of this engine may be permissible, as many, no doubt, have forgotten the former explanation, while to others the matter may be entirely new.

The Diesel engine is essentially an oil engine, and not a gas engine. Gas engines and previous oil engines, which acted on the gas engine principle, have all in common the explosion of a charge. This charge is a mixture of a given quantity of gas, or a given quantity of oil vaporized so as to act as a gas during the process, combined with a quantity of air, varying from 7 to 11 times the volume of the gas or vapor. It was well known that some previous compression would add to the economic results of the explosive action. But in all cases the power was obtained by an explosion which, from the moment of ignition, was beyond the control of the operator or of the governing mechanism of the engine. This fact limited the efficiency of all governing devices which could be applied, and troubles with the igniter caused other irregularities, so that even where local conditions made the gas engine (or vaporized oil engine) the worthy competitor of the steam engine, uncertainties of its operation threw doubt on the wisdom of the substitution.

Furthermore, a cheap gas, necessitating the installation of a large and cumbersome producer plant, was the only escape from such costly fuels as gasoline or kerosene.

The Diesel engine made the use of the cheapest liquid fuel, such as crude oil, fuel oil, and distillates possible. To these recent experimental developments promise to add the product from gas works, known as light water gas tar.

The Diesel engine works on an entirely new principle. First of all it dispenses with the so called charge or mixture, which in all explosive engines must vary only between the limits of one gas to 7 air and one gas to 11 air. Its cycle is the same as the gas engine, the well known Otto cycle. There its similarity with the gas engine ends absolutely; in everything else it follows the precedent of the steam engine.

Its first stroke is a suction stroke, drawing a cylinder full of pure clean air; on the second stroke it compresses this to a tension and consequent temperature sufficent to ignite any fuel which may be injected into it; at the beginning of the third stroke a small quantity of fuel oil is injected into this red hot air as a spray by a jet of highly compressed air, and thus in a completely pulverized state the fuel meets and mixes with the hot compressed air in the cylinder, burning completely, and during a period of time exactly regulated by the governing mechanism of the engine, generally through one-tenth part of the stroke, subsequent to which the stroke is finished by the expansion of the burnt products; the fourth stroke discharges these product of combustion and leaves the cylinder empty and ready for another suction stroke.

It is evident that the work expended in compressing the cylinder volume of pure air, is given off again to the shaft of the engine during combustion or motor stroke, so that the loss is simply the frictional loss during the compression stroke.

This simple process, absolutely new and original with Diesel, has enabled him to accomplish with ½ pint of common crude or fuel oil as much as the explosive engine does with a full pint of the much more expensive gasoline.

A recent comparison of results extending over a period of regular daily service of six weeks has shown the consequent economy of the Diesel engine over a first-class gasoline engine, which it displaced, of 600 per cent.

The modest statement set forth some years ago by the promoters of the Diesel engine, and covered by absolute and binding guarantees, are that 100-horse power hours measured in the crankshaft of the engine will require not exceeding 8½ gallons of crude or fuel oil when the engine is running at or near its greatest capacity nor more than 9½ when it is running at or near half load. The Diesel engines which furnished all the electric light and nearly all the power for the German Tyrolean Alps at the World's Fair, St. Louis, furnished 100 horse power hours on the switchboard while running at loads varying during the day at ¼ to full load with a consumption of only 7½ gallons of common fuel oil from Whiting, Ind. At 3 cents per gallon this means 100-horse power per hour at 2½ cents or 100 kw. per hour at $3\frac{1.5}{10.6}$ cents. While in some localities such fuel oil or crude oil, delivered in carload lots may cost as high as 4 cents per gallon, it is readily furnished in many localities contiguous to oil fields at 3 cents and even 2 cents per gallon.

The regulation in the Diesel engine is not dependent on hit or miss, but can be followed up or down the scale as closely as in a steam engine. In the latter it is a question of cutting off more or less from a pretty large volume of steam at each stroke; in the Diesel engine it is the finer one of cutting off a more or less minute quantity of oil from the small volume delivered by the fuel pump at each stroke. It is accomplished by direct action of the governor on the suction valve of the fuel pump, which is held open during a greater or less portion of the pressure stroke, and thus the pump delivers the exact qtantity of oil required during each motor stroke of the engine. While the mechanism is necessarily smaller, and more delicate than in the steam engine, it also requires less power and its effect is more immediate.

In a compound steam engine the volume of steam left in the high pressure cylinder at the point of cutoff must be used in the next stroke of the low pressure cylinder whether at the time more or less would be the proper quantity for that stroke. In the Diesel engine the regulation acts on each cylinder just at the time and in the exact quantity then required.

There remains only the drawback common to all 4-cycle engines, that there is but one motor stroke for every two revolutions. For electric light work triple cylinder engines and heavier flywheels succesfully overcome this, while for electric railway work resort is had to still larger flywheels and 6 cylinders by coupling 2 triple cylinder engines at the two ends of the dynamo shaft.

As for the accesibility, reliab.lity, and durability of the engine, 3 years of experimental work have placed these fully on a par with the best steam engine practice, and since then 2 years and in some cases nearly 3 years' of continuous service by a number of Diesel engines of the New American Type give sufficent examples of the success in this work.

## A Feature of the Mueller Manufacturing Company's Exhibit at the St. Louis World's Fair.

Members of the gas fraternity who visited the St. Louis Exposition no doubt noticed the large billboards advertising the Mueller Company's brass goods which were erected along the rights of way of the several railroad lines entering St. Louis. So far as known this enterprising firm was the first of the prominent manufacturing concerns in the trade to attempt general advertising by billboards, and there has been no little speculation in trade circles regarding the profitableness of the campaign.

We are assured by the Company that, on the whole, the plan was a flattering success. Users of goods in the lines manufactured by the Company had their attention frequently called to the location of the

Mueller exhibit by the large signs, and it is safe to say that few of them failed to make a mental note of it. Of the thousands of visit rs who called at the exhibit many stated, upon entering the inclosure, that their attention had been directed to the display by the handsome signs along the railroads.

Exclusive of their purpose of directing the notice of brass goods users to the exhibit, the signs were also the means of piloting other visitors to the Company's booth. Among the latter were many foreigners, and since the close of the Exposition the Company has received a large number of letters from travelers, foreign agents and sightseers, who mentioned that they owed a pleasant hour's entertainment in the booth to the handsome billboards which had called their attention to it. Among the letters received were many inquiring for catalogues and price lists, indicating that many who were attracted to the exhibit by the signs had made a careful note of what they had seen and had determined to take up negotiations for exploiting the Company's goods in the countries of their own homes.

## The Testing of Incandescent Burners and Mantles.

By Mr. Victor A. Rettich, in *Journal of Gas Lighting.*

I am much gratified at the amount of interest shown in, and the space you are allotting to, the subject of mantle and burner testing, and regret that the time taken up by the mails will bring this communication on the subject a little late. The facts of having brought such giants in our profession as Messrs. Abady and Leicester Greville to enter the arena and ventilate their ideas, and of causing Mr. Holgate to explain away his inconsistent readings, have been, to me, a most satisfactory outcome to the suggestions published in your issue of Nov. 1. Some months back (in January or February), I approached one of the chiefs of the Washington Bureau of Standards on the subject of testing a special burner; but at that time they were not equipped for a mantle test in any shape. I pointed out the enormous field of this method of lighting, and respectfully suggested that the necessary appliances should be installed. Not having heard further, 1 wrote again on Nov. 17 to the aforesaid gentleman, and had a reply in which it is said that "I believe that the Bureau of Standards at Washington is now open for work; the address is: National Bureau of Standards, Washington, D. C."

Of course, these tests will be along the lines indicated by Mr. Leicester Greville—that is to say, they will testify that on a certain day (barometrical and thermometrical conditions observed), at various pressures, with a specified quality of gas of known B.T.U.'s, the burner and mantle supplied will be stated to give such and such results. During the past few months, the writer has had "official" tests made by impartial authorities, such as Columbia University, New York; Institute of Technology, Boston; Trinity College, Hartford; Harvard University, Cambridge, etc:, and has received reports similar to that outlined above, giving a description of the burner and the mantle, together with the type of photometer used, the disk box described—incidentally, the Lummer-Brodhum seems to be a favored one here—and the standard specified (16-candle electric lamp at a given voltage with an efficiency of ± ¼-candle power in most cases). At the same time as the various tests were conducted with the burner in question, for the sake of comparison, one of another make—the American Welsbach—was also tried, with the same mantle and chimney. The results are not given here, as they would, to repeat Mr. Abady's words, savor of advertisement.

For the information of those who are unacquainted with the American

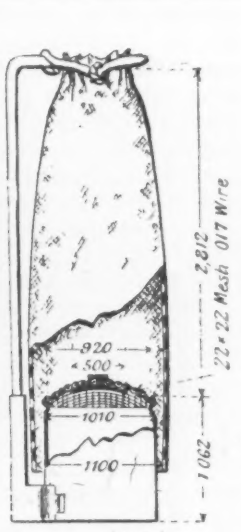


Fig. 1.

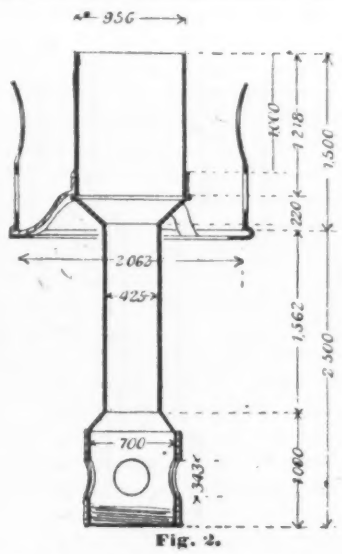


Fig. 2.

methods, it may be here stated that the mantles used on all the aforesaid tests are mounted on a cap similar to the way mantles were sold when the writer joined the English Welsbach Company in 1890. This cap was patented at the time by the late Manager of the Company, Mr. Heald; but the Americans have modified it, as shown in Fig. 1. Mounted in this manner, they are easily transferred from one burner to another; and as the large majority of lamps sold here are designed to carry this method of mounting, and are provided with adjustable gas checks (and in many cases provisions for air regulation beside), a certain proportional similarity of results may be obtained in different localities with entirely different qualities of gas. With this knowledge, I am still tempted to think that a standard burner and mantle may yet be established, and send a sketch as a suggestion to that end, and give measurements in thousandths of an inch. I believe I am correct in saying tha', with the mantle which has been referred to—namely, the No. 197—it is customary to destroy those that exceed certain dimensions.

I shall take pleasure in sending you, Mr. Editor, some of these mantles for your inspection, and ask you to be good enough to hand some to such gentlemen as you think are sufficiently interested. My own experience leads me to conclude that the consistency in results of tests is convincing.

While it has yet to be settled as to the definite influence the candle power of gas has upon the efficiency of the mantle burner, I have found, roughly speaking, that the light value of the 5-foot Argand will approximately represent the candle foot hour of the mantle burner as Fig. 2—that is to say that, when using a good mantle on such a burner, at its best duty, five times the amount of light should be obtained per foot of gas compared with the statutory candle power. Whether the dozen or so tests that have been made in different towns have given this result by chance, or if it would eventually be a fact, remains to be proved. The following analysis of the various candle power of gases of 816 towns in the United States, as given in "Brown's Directory," may be interesting:

| | | | | |
|---|---|---|---|---|
| 16-candle power gas | | | 7 | per cent. |
| 17 | " | " | 7 | " |
| 18 | " | " | 28½ | " |
| 19 | " | " | 4½ | " |
| 20 | " | " | 16 | " |
| 21 | " | " | 3½ | " |
| 22 | " | " | 17 | " |
| 23 | " | " | 3½ | " |
| 24 | " | " | 5 | " |
| 25 up | " | " | 8 | " |

The writer hopes to visit a large number of these towns, or have reliable tests conducted, and at a lated period will communicate the results. In this manner a factor may be determined when a standardizing bureau has been established.

The Buhlmann process of mantle making should, from the description, give a great similarity in the mantles made; and it would be well to have some of your readers' impartial opinions as to how far these mantles are alike, in shape, diameter, candle power, and life as regards maintenance of candle power.

In my next communication, I hope to answer Mr. Abady's article seriatim; but for the present I venture the statement that if everyone

shared his views, it would be useless for any company, in advertising their burners, to state what the efficiency of them had been found to be. If manufacturers in the past have made claims of efficiency for any particular burner, which may have appeared excessive to Mr. Abady in the same manner as they have impressed the writer, has this error not been due to lack of proper facilities and a standard to be followed rather than to any intentional purpose to deceive? My argument is that, if a Standard Bureau were established, an efficiency given by it would be much nearer the actual result than a test made here or there under varying conditions and varying standards.

Again referring to my own tests during the past week, a German mantle of ¾-inch diameter and 3½ inches long was placed on a suitable burner, and after 10 minutes' burning gave a light of 104 candles with 2.8 feet of 23-candle power gas—an efficiency of 37.2 candles. But in 3 hours the candle power was reduced to 53. Would one be justified in claiming 37 candles to the foot? I say, no. To reduce this to an absurdity, if I took a 1-foot burner and put magnesium ribbon into it, I might get 200-candle power so long as the ribbon lasted. The same burner with a staple commercial mantle will give an efficiency of 23, and maintain this for a long period. That is what I would call the true efficiency of the burner and mantle.

To again refer to the Buhlmann process, the laboratory is reported "to be replete with appliances for testing * * * the various chemicals." This being so, I contend that not only 2 but 2,000 mantles can be made alike. The less one depends upon human skill, the greater the uniformity in manufacture should be. Over here, mantle heads are all gathered and sewn by machine; so that any agreed opening at the head may be accurately perpetuated.

Mr. Leicester Greville does not seem to fear the result of getting a reliable individual test, but thinks the universal system impossible. I suggest that a universal test may be reached in this way: Take a burner of proportions as Fig. 2, on which put one of the lot of mantles agreed upon to be the standard. After burning it 10 minutes, take 10 readings, repeat the same for (say) 3 or 4 days, then average the 30 or 40 readings and, for argument's sake, assume 20 candles to be such figure. Another mantle is sent to be tested; after burning 10 minutes, take 10 readings and leave burning continuously, and take 24, 48 and 72 hour readings. If the third day shows no appreciable falling off, again test your standard mantle about the same time as the one under examination, so that the same make of gas will be used and the atmospheric conditions will be equal. For some reason we will assume our standard only gives 19 on the day in question, and the other one gives but 17. It then becomes a simple equation, that with 19 being 20, 17 becomes 17.9, which I would then judge to be the duty of the mantle. When testing the burner, a precisely similar method can be carried out, with this difference—that the result may be reached at once. So that on any particular day we will assume our 20-candle mantle to be giving 20½, and when placed on the burner to be tested, gives 24. By the same rule, I would describe the burner as giving an efficiency of 23.4.

No gas cheek is shown in Fig. 2, as an adjustable one of preferred design can be agreed upon—one, I would suggest, in which the potential energy of the gas is least impaired.

## The Graham-Morton Company's Show at the International Gas Exhibition, Earl's Court, London, E. C.

Following the thought in the heading, we may say that the Graham-Morton booth is 13. Its area is close on 600 square feet, and its location such that it can no more be missed by visitors to the Exhibition than can the front door of a house by its tenants. It offers an engineer's welcome to all who come to see the innumerable things worth seeing at Earl's Court, and have not left their eyes at home.

The exhibit is original, novel and interesting. It is. moreover, of wide scope, combining as it does five different kinds of conveyors, applicable for handling coal and other heavy material.

The scheme is an excellent one, and the exhibit particularly attractive, as the machinery is shown in motion, the coal passing automatically and continuously round the whole of the plant and through each section of the apparatus.

A brief examination of the display brings out its special points to advantage, and very clearly. The exhibit is self-contained and thoroughly representative of this class of machinery.

The gravity-bucket conveyor is fed automatically by the receiving hopper. A noteworthy feature in this design of conveyor is the overlapping of the buckets, which facilitates feeding and obviates the spilling over the sides of the material fed into it.

A variety of this gravity bucket conveyor is made with separate buckets, *i. e.*, without the overlap. This variety is fed by means of a revolving filler. A special advantage of this class of conveyor is that it can be driven with a very small amount of horse power. In gas works this consideration has not the economic force that it has in other industrial workshops, inasmuch as breeze, dust and other refuse are available for conversion, by means of forced draught.

Both varieties of the gravity-bucket conveyor have been extensively installed by the exhibitors; one of the best examples being at the Neasden power station, for the Metropolitan Railway Company. For handling coal, coke and oxide in gas works and elsewhere this type of conveyor is exceedingly useful. The exhibit shows the overlapping gravity-bucket conveyor, carrying the coal overhead and depositing it into a Graham's patent rubber belt conveyor. Some of the principal advantages of the rubber belt may thus be summarized:

(1) Small amount of horse power for drive.

(2) Long length of belt which can be utilized for transport.

(3) Perfect control of varying speeds, according to the requirements of the material carried. It is not surprising to learn that the firm have erected hundreds of these belt conveyors in the United Kingdom, in Great Britain and in foreign countries, the sizes varying from 12 inches to 48 inches in width.

A patent of considerable value in this connexion held by Mr. Maurice Graham, is the drawn steel tubing for the idler rollers.

One of the most useful servants in the gas works that assists in storing the coal is the rubber belt conveyor. As one examines the exhibits one observes that the coal is thrown off the belt by means of a tripper carriage. The latter may be so designed that it can automatically moved by the motion and the power of the belt itself, along the whole range of the coal stores or tanks. The value of the automatic feed may be still further enhanced by its passage from a full bunker to an empty, where it coutinues to operate, until this in its turn is filled, when it automatically moves on to repeat the operation. Visitors to the Exhibit will notice that this conveyor is fixed upon timber packings, which will suggest to them facility of erection, ready packing and, therefore, particular applicability to the Colonial market.

The coal is delivered from the belt conveyor on to a continuous, double-sided push-plate conveyor, the advantage of this type being that it can be utilized both at top and bottom and acts as two push-plates, so performing double duty.

A conveyor constructed on this principle can be seen working at the Leeds electric light works, filling the coal stores and automatically emptying them.

Immediately underneath the coal store shoots are placed in position, which deliuer on to the lower trough of the conveyor.

The makers offer a convincing example of the worth of this apparatus at the Nanterre gas works, where the coal is taken from the boat into the coal stores, passing automatically from the latter into the bunkers or the retort house, at the total cost of 2 cents per ton.

The double push-plate conveyor is shown delivering the coal into two other designs of conveyors, the ordinary push-plate and the tray conveyor; the latter is largely used for coal, coke and other heavy class material. It will be noticed that it is built up of overlapping plates, and is shown on rollers, although it can be made similar to the standard picking-belts, manufactured by the exhibitors, and widely used in collieries.

All over the world hundreds of these tray conveyors are at work, Messrs. Graham-Morton & Co., making a special feature of packing for shipment; turning for a moment to a consideration of the push-plate conveyor, it will be noticed that the push-plates are supported on roller wheels. A similar conveyor is in operation at the Gas Light and Coke Company's works, both at Fulham and Bow Common. Each was erected by the exhibitors.

Push-plate conveyors are made in all sizes, from 12 inches to 30 inches, and are particularly useful and applicable for filling automatically coal stores, bunkers, etc., it being only necessary to open the whole of the slides in the trough bottom, which permits of coal passing on to each successive opening.

A slight variation in the design of a push-plate conveyor, which allows of it running along greenheart liners, by an arrangement of skidder-bars, has been adopted with marked success in many instances, Messrs. Graham, Morton & Co. having been called on to construct and erect such plant.

A little thought will reveal the fact that the practical principle of the gravity-bucket conveyor and the push-plate conveyor is identical, although in the actual working there is a slight additional friction due to the escaping of the coal along the trough in the case of the latter.

## Chemistry in the Foundry.

By Dr. R. Moldenke.

In discussing this rather broad subject before an association of practical foundrymen it would seem best to take it up from the standpoint of what immediate good it will do each member interested. The foundry owner must be convinced that the use of chemical knowledge in his establishment will bring him direct returns before he feels called upon to change existing conditions and to add another department. Furthermore, once the founder is convinced that it is a commercially wise procedure to work on more rational and scientific lines, he will weigh very carefully the temperament and progressiveness of his shop management so that a radical departure of this kind will not disrupt his organization and leave him temporarily worse off than before.

With the stuff our modern foundry foremen and superintendents are made of there is little danger of opposition to advanced methods, for the eagerness with which the rank and file of the shop have taken hold of the chemistry of iron is in itself a sharp rebuke to the great majority of foundry owners, who profit by the progress made, but are careful not to contribute financially to the further advance of foundry science.

Granted that the careful foundry proprietor, who reads his trade journals regularly and has thus learned that the foundry advance has come to stay, finds that his employees are just as much interested as himself. It remains to see how he will apply the chemistry of foundry materials and processes to the best advantage. This will be the purpose of what is to follow.

*The Evolution of a Metallurgist.*—It is a mistake to think that the first thing wanted is a laboratory and an analyst to dissect everything bought and made regardless of conditions. This mistake has always brought with it unpleasant consequences and has really retarded progress rather than advanced it. I remember buying a complete laboratory for my own works from a competitor further West, who had put it in, hardly used it, and then sold it in disgust. When I first was so fortunate as to get an opportunity to study the chemistry of iron, the far-thinking president of the large establishment introduced me as a new clerk. My time was partly spent in routine work, such as keeping records, but I was instructed to keep my eyes open and absorb foundry knowledge. In this way none of the practical hands of the works suspected the radical changes that were to follow. I can truly say I did not myself. The desirability of rearranging the thousands of blue prints which were in constant use at the foundry in question came up, and then it was discovered that I was a draftsman. A little matter of the proper size of pipe for supplying a forge shop with the necessary steam for power developed the fact that I was an engineer. In the meantime some tests on the composition of the bad material of our business rivals required the fixing up of a small room with shelves, water supply, gas and some chemicals and apparatus. Then it dawned upon the troubled shop management that I was a chemist. In the meantime the complete redesigning of the power plant, the introduction of electric light and power, and special problems in the direct manufacture of the specialties we sold had gained me the confidence of all the fair and open minded men in the place, so that when it finally turned out that I was there for standardizing the process and shop methods everyone was ready to help me do it. It was then I became a metallurgist. I owe it not so much to ability, but to the forethought of my employer, who avoided the open, or still worse, secret opposition of the men who were to be benefited while being controlled, by keeping them in the dark until the work spoke for itself. I owe it to the men themselves, who afterward went out of their way to report to me every peculiarity of behavior of the metal in cupola and furnace, wishing themselves to learn the explanation and in reality teaching it to me, as the trained investigator can quickly grasp the facts of the case and what they are apt to lead to.

While in the early days of foundry progress along scientific lines this way of getting started was essential to get resuts that paid, and it is not now so difficult or costly to get the iron end of a foundery on correct lines; yet it is still wise not to go too fast, but to use the cheapest means to the end until the progress made warrants the addition of a complete laboratory department.

*Chemistry Profitable in the Purchase of Iron.*—The very first place that the chemistry of iron can be made to pay in a foundry is in purchasing the pig iron. The revolution in this respect that our early investigators, and more especially the American Foundrymen's Association, have brought about is hardly conceivable, so far-reaching in its effects has it been. To-day over three-fourths of the iron bought is on chemical specification. I am in constant receipt of inquiries from foundrys and pig iron brokers alike relative to the specifications for foundry pig iron recently advanced by the American Society for Testing Materials, and since amended at the request of the foundrymen to cover their wants more fully.

Here the foundryman, once he knows what he needs for his work, can specify the analysis required, and is certain of getting a more uniform material than ever he could when iron was judged by its fracture. The variation allowed the furnace before the shipment becomes subject to penalties, or even rejection, is such that a careful spreading of each carload on the last one of the same approximate composition, and drawing from the end of the pile, will give such uniform charges that, with a good melter at the cupola, no anxiety need be had about the metal tapped out daily.

Contrast this with the old way, when worry was written all over the faces of the foundry officials from the making up of the charge until the shaking out of the first castings before going home. I have myself seen 12 different brands of pig iron put into a mixture in small quantities, in order to avoid chances of variation due to a disagreement of the fracture appearance with the actual facts. On the other hand, I have run month in and month out on one single brand of pig iron piled up in my yard in four lots, with the silicon ranging from 1.75 to 2.50, and never was bothered with complaints from the machine shop or customers.

This may be said to be the first benefit of the chemistry of iron to the founder, and he needs no laboratory for this on his own place, but simply a consultation with some one who knows what he requires in the first place, next careful sampling by a bright foreman or assistant and then a commercial analysis,

I would therefore urge every one to get him a copy of the standard specifications for foundry pig iron and study them with a view of his next ordering.

*The Selection of Coke.*—For coke the matter is not quite so far as yet. We all know now that too much sulphur is detrimental. We also know that it is not the appearance and the name of a coke that make its good melting qualities. Even the tough looking by-product article is now recognized as first-class, if it is of the proper composition and the burden of the cupola be arranged to suit its structure. A committee is at the present time being formed to study the question of a standard foundry coke, issue specifications for the purchase of this standard, with penalty and bonus for variations therefrom. So in a short time this issue will be dealt with and bring much good to the foundryman.

As it is, you can specify and buy your coke with the sulphur down to 1 per cent., provided the makers will give it to you, and with a good coke or anthracite and uniform iron your charge on the cupola platform is as good as can be made, being the practical application of science where it pays well, and all this with a cost of but a few cents a ton added to the iron tapped at the cupola spout. As a simple matter of insnrance this added expense should be granted by every foundryman, for it saves many a dollar otherwise wasted and lost, usually at a time when he can least afford it.

*The Chemistry of the Melting Process.*—I mentioned before that once a founder knows what he needs in the way of the compositions of his irons, he can make his mixtures from the analyses of the iron he buys, and thus keep himself out of trouble. To do this properly he must understand a little of the chemistry of his melting process, so that he can allow for the changes in composition brought about by it in his charges, and it presupposes that he knows the composition of every portion of the iron going in. This means specifically the pig iron and the scrap. The latter is the less certain element of the calculation If the founder takes only his own scrap, he may get along with an occasional analysis of this, so as to get the proper factor for his mixture calculation. But when he buys a lot of outside material to add to his own sprues and gates, the problem becomes a little more complicated, but requires only repeated determinations of the silicon and sulphur of his daily product, so that this uncertainty may be removed. It is here where it will pay a large works to have a laboratory.

When we come to the specialties, such as car wheels, chilled rolls, malleables, and the like, a correct and safe procedure can only be had by a daily analysis of practically every heat, at least for the silicon. This gives the key to the succeeding mixtures at hand, and the run of successful heats should be practically unbroken. I have had no difficulty in taking off 1,000 heats at a stretch without making any bad iron in that time. In fact, it became only a matter of furnace repairs, which were reluctantly made when the iron showed signs of suffering from being compelled to remain in the bath too long for its subsequent good behavior.

*Safe Limits have been Widened.*—I have purposely refrained from going into the effect of greater or less quantities of the constituent ele-

ments of cast iron on that material, for this has been ventilated freely by able metallurgists. It seems fitting to say, however, that with the knowledge we have at the present day the safe limits within which we can turn out our daily work have been widened considerably. The correlation of silicon and sulphur, for instance, can be used in such a way that many a brand of iron habitually high in the latter element may find its way into a mixture, properly counterbalanced with silicon, and successful castings made. The proper use of steel scrap in fairly large quantities for the purpose of reducing the total carbon of the metal, and thereby making it stronger, is a direct result of our knowledge of the chemistry of iron. If now we could only add an alloy to such a melt which would have a similar effect on it as does ferromanganese on steel from the converter, a great stride ahead would have been made. I confidently predict that a fortune awaits the man who brings out this material, which would render the art of casting high grade metal still more certain than it is to-day. Indeed, I may say that it would enable us to use irons in both the cupola and the furnace which to-day are put into sash weights. There are problems in the chemistry of iron ahead of both blast furnaceman and foundryman, which we are bound to meet in the next 50 years; for the rich and pure ores now available will be exhausted eventually, and the poorer and more impure ones will have to take their place. If at that time the foundryman is in position to take a high sulphur pig iron and desulphurize it in the cupola process; if he can take a heavy percentage of burnt grate bars or other similar scrap and still turn out high-class castings, then he may consider himself as not fallen behind in the procession.

*The Air Furnace Growing in Favor.*—The growing favor with which the air furnace is being looked upon for regular foundry work is also bound to help the industry. The additional cost of the process is easily counterbalanced by the superior work turned out. One large establishment is beginning to make all its engine castings in this way, and I know of many places where the substitution of furnace iron for the cupola would mean longer life for castings which must be made of cast iron to be used at all. Founders might, therefore, give this matter some attention in the near future. It means improving their product in that it keeps the metal from contact with the solid fuel, means less sulphur, less carbon, greater uniformity in the metal; in fact all the advantages which gun iron has over the ordinary run of cupola work.

We Americans are said to appropriate every good idea we find on the other side of the water, and so we have taken Professor Turner's discovery of the action of silicon on the carbon in cast iron. We have taken Professor Ledebur's studies of the condition of the carbon in the malleable casting, and have pushed these inquiries far ahead in connection with our daily work. It is gratifying to see that now England and Germany are awakening to the importance of the chemistry of cast iron, and foundrymen's associations are being called to life, whose primary object is to study advanced methods of working. We wish them all possible success, and hope that their transactions may contain much new material that we can appropriate and amplify later on. A rivalry which means the freest interchange of information is a detriment to no one, and stimulates research as well as commercial enterprise. May we learn much more of the chemistry of iron in our foundry practice, and gradually clear away the doubtful portions which still remain to let us feel how little we really do know.

## Coaling at Sea.

By Mr. P. C. Ferguson, in *Tech. World.*

The present war between Russia and Japan, and, in particular, the sailing of the Baltic fleet for the scene of hostilities in the Orient, not only show the importance of having numerous coaling stations, which must be strongly fortified and garrisoned and made self-defending, but also indicate the necessity of having ample means for coaling at sea when great distances must be traversed and when neutral harbors are not open for coaling purposes.

Many plans have been proposed for coaling ships at sea, a large part of which are considered unsafe by prominent engineers. During a heavy sea it is generally considered unsafe to employ broadside coaling; and the "end-on" system of cableway plant is usually employed. In order that this system may be safe, experienced engineers maintain that a good distance must be provided between the battleship and the collier, 400 feet being considered a minimum by conservative experts, while no connecting line should be made fast to both ships except the tow-line, so that, in the event of the tow-line parting, the lines of the cableway would clear themselves.

A marine cableway permits a fighting vessel to stay in the fighting line, and allows a fleet of war vessels to arrive off the enemy's coast with bunkers full instead of being displenished. No navy can have too much coal, or too many ways of obtaining it, in time of war.

One of the most important improvements in coaling ships under the marine cableway system, has been in the method of delivering the coal after it reaches the deck of the vessel. Until recently, as on the U. S. S. Massachusetts, a pair of shears were erected and guyed, supporting a large canvas chute, through which the bags of coal were dropped. This has now been dispensed with in some instances; and the ropes of the cableway are pulled down by means of a "nigger-head" on the quarter-deck winch at the time it is desired to dump the load.

In harbor coaling, nigger-heads are used, and they will hoist 2,240 pounds at the rate of 300 feet per minute. The slipping drum will develop a rope speed of about 1,700 feet per minute, and will lift a load of half a ton. These winches operate the load carriage between the collier and the warship, one winch carrying the loaded carriage toward the warship, the other drawing the empty carriage back to the collier. For this purpose, a single wire rope, about 2,000 feet in length and $\frac{3}{8}$-inch in diameter, is employed. In many cases both winches are operated by electric motors, and run all the time in the same direction, the ropes being always taut. The friction of one slipping drum overpowering the other gives the reciprocating motion to the load carriage. The rope is being wound up on the drum of one winch, while it is being paid out by the other drum under tension through the slipping of the friction head, the heat developed by the slipping being dissipated by air passages and radiating fins.

It is stated that this method of operating a load carriage is independent of the relative motion of the two ships, since, when the ships pull apart, one drum slips, thus paying out rope, while the slack given to the rope is wound in when the ships approach each other. It is essential, however, that the rope speed of these winches be greater than the speed at which the ships approach each other.

It may be of interest to note some details of the electrical equipment of one of the Russian battleships for taking a supply of coal while at sea.

The ill-fated battleship Retvizan, disabled by the Japanese at Port Arthur, was equipped with the Lidgerwood-Miller marine cableway, which is an American system of coaling at sea. This system is operated by two electric winches, the slipping drum being mounted on the armature shaft of the electric motor. The drum has a diameter of 14 inches, and gives a rope speed varying from 1,200 feet per minute at full load to 2,000 feet per minute at half load. The first warship to be completely equipped with the marine cableway, was the U. S. S. Illinois. Its equipment will permit that battleship to take coal at sea from any masted vessel that it may meet in any quarter of the globe. The British collier Muriel, on several sea trials, delivered from 35 to 40 tons of coal per hour in a moderate sea and half a gale of wind to H.M.S. Trafalgar. The battleship towed the collier at speeds varying from 8 to 11 knots an hour. The same collier also coaled H. M. S. Empress of India at sea at the same rate; and at one of the English trials, Vice-Admiral Sir G. H. Niel had his fleet of 17 ships witness the operation for the benefit of the officers on board.

By having warships equipped in this way, it is claimed that the question of coal supply is largely solved, since vessels can coal directly from any collier and are not dependent upon coaling stations. Any masted ship, either sailing vessel or steamship, can do duty as a collier, and deliver its coal at sea to any warship equipped with a marine cableway. Even a destroyer could be coaled at sea by a collier, when properly equipped. Capt. E. M. Shepard, U. S. N., lighthouse inspector at Tompkinsville, N. Y., has stated that "out of 365 days ending November, 1900, the log book of the Sandy Hook light-vessel shows that the sea was smooth 121 days, moderate 196, rough 47 days, and very rough 1 day." It is claimed that coaling at sea could have been accomplished 317 days out of the 365 off Sandy Hook.

The load starts out from the collier on a down hill route, continuing so for more than half the distance. When the load is just clear of the center of the span and in its lowest position, the man on the quarter-deck of the warship commences to pull down the block. By the time the bags reach the haul-down block, they will be trailing on the deck. The operator will stop for an instant, the lowering will continue for a foot or more, the load will be unhooked from the carriage, the empty bags put on, and the whole allowed to rise to its normal position. At the same time, the operator on the after-bridge will send the empty carriage back to the collier for another load by means of the electric winch above referred to.

## Illuminating Gas from Coke Ovens in England.

According to the *Gas Engineer's Magazine*, at the town of Royston, in Yorkshire, a scheme of gas supply from coke ovens has just been put into operation, the results of which will be eagerly watched by coke manufacturers. Royston is a colliery town with about 7,000 inhabitants, about 4 miles from Barnsley and 8 from Wakefield. The district was in the area of the Barnsley Gas Company's Act of 1867, but that Company have not taken advantage of their powers. In view of the success that had attended the utilization of coke oven gas as illuminating gas elsewhere it was decided to light the town from the waste gas coming from the Simon-Carves ovens at the New Monckton Main Collieries. In February last a new company—the Royston (Yorkshire) and District Gas Company—was formed, with a capital of £10,000, Mr. Henry Ellison, tar distiller, Cleckheaton, being the chairman. The company have entered into an arrangement with the Royston Urban District Council to furnish the district with a supply of gas for public lighting for 25 years. The maximum price to be charged for the gas has been fixed at 3s. 9d. per 1,000 cubic feet for private consumers, 4s. 2d. for slot consumers, and 3s. 6d. for public lighting, and at that price the company are entitled to pay dividends equal to 7 per cent., and for every penny reduction they are further entitled to increase their dividends by 1 per cent.

The gas is taken on by central pipes from the top of the present battery of 35 ovens. It is collected in a large main and from this is passed through arch pipes, into a hydraulic main in the ordinary way. The existing battery of ovens is capable of dealing with 160 tons of coal a day, and the production of gas is about 10,000 cubic feet to the ton. After leaveng the hydraulic mains the gas is cooled and treated in scrubbers and washers by the Colliery Company, and the ammonia is extracted; the average yield being 25 pounds per ton of coal. The Colliery Company then deliver to the Gas Company the gas they require; and the surplus is used for the heating of the side walls of the ovens, and for boilers. The gas sold to the company is purified before being measured; and is charged at the rate of 6d. per 1,000 cubic feet, if over 10,000.000 cubic feet per annum is consumed. The gas is then enriched by what has been taken from it in the earlier stages, viz., benzol. The unenriched gas has an illuminating power varying from 5 candles to 10 candles, and by the use of benzol the power is raised to 16 candles or over.

It will be obvious that little extra plant has been required. The Gas Company has been called upon to provide a set of purifiers, manufactured by Messrs. T. Tattersall & Sons, Long Lea Ironworks, Elland; a carburetting plant, by Messrs. Simon-Carves', Limited Manchester; and a steel gasholder and tank by Messrs. R. Dempster & Sons, Limited, Elland, on the Gadd and Mason principle.

One difficulty was met with, namely, the piping of the houses. The landlords and householders refused to contribute to this expense, and the Company had to fix all services, meters, and internal pipes and fittings free to every house in the district. This has cost over £5,000. The mains now laid extend to over 5 miles, service pipes to the length 8,700 yards have been put in, and about 900 meters, 800 of them on the prepayment system. These meters have been supplied by Messrs. Alder & Mackay. As a result of this enterprise, not a single house in the district will be left without a supply of gas. The District Council have also given orders for the erection of 80 street lamps.

The Company have also built a large showroom, where the latest and most improved methods of using gas are on view, and where a gas exhibition is being held this week. The authorities of two adjoining areas have already approached the Company with the view of also securing a supply. If terms are arranged it is calculated that the present estimated consumption, in Royston alone, of about 15,000,000 cubic feet per annum will be increased to something in the neighborhood of 35,000,000.

It may be added that Messrs. Simon-Carves, Limited, are at present erecting a further battery of 36 ovens, so that no shortage of gas is likely to confront the Gas Company, in addition to which the Company are now considering the question of putting up 2 beds of 6 retorts on the regenerative system, as a standby for emergency. The price at which the gas is to be supplied certainly leaves a margin for profit sufficient to satisfy the most exacting pessimist, and no doubt the price of gas will be rapidly reduced with resulting increased dividends to the promoters of the Company. The claim is made that this plant is the pioneer one, but we are under the impression that illuminating gas was supplied some time ago to the village of Canklow, Rotherham, from the Simon-Carves' coke ovens at the Rotherham Main Collieries of Messrs. John Brown & Company. We believe this is the pioneer instance of illuminating gas being supplied in this country from by-product-coke ovens to the public.

## SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, Dec. 10th, 1904.

*A Gas Engineer's Paradise.—The Triumph of Welsbach.—Some Other Developments.*

After spending two whole days at the International Exhibition of Gas Appliances at Earl's Court, I unhesitatingly pronounce it a great success, and that in more than one respect. The only approach to a similar undertaking that has previously been held in England is the Crystal Palace Electric and Gas Exhibition of 1882, which depended to some extent for attractiveness on the supposed rivalry between the two. The gas section on that occasion was not comparable with the Exhibition now running, and which comprises over 200 groups. Some indication of the value of the exhibits has been given in previous letters, and it is impossible in the space at disposal to make anything like adequate reference to individual stalls; so I will only say that, with one or two notable exceptions, the principal firms in the trade are represented, and that most of them appear to have decided that if worth doing at all the thing was worth doing well. Without being invidious, it is possible to recognize the enterprise and sympathetic assistance extended by the Gas Light and Coke Company, in whose district the show is located, and which has assisted in no small degree towards the general success. They have erected a handsome device over the main entrance, some 40 feet in length, composed of various kinds of gas burners and using 6,000 cubic feet of gas when in operation, and they show a very complete selection of tar products, also several furnished apartments illustrating the application of gas in the cottage and in the mansion.

Any trade exhibition depends for its very existence on the enterprise of the exhibitors and their willingness to provide attractive groupings without necessarily making expense the first consideration. There are no shortcomings in this respect, for I have never seen better arrangements at any exhibition for setting forth the various classes of machinery or articles produced by each firm, and hope that the results will more than justify the means. In one respect the Committee are at a disadvantage, for the structure at their disposal will not bear comparison with the elegant spaciousness afforded by the Crystal Palace, a defect that is particularly noticeable in connection with the effective display of high power lights. It would be a misnomer to call them "buildings," as brick or masonry are conspicuous by their absence, and the principal materials are boarding and corrugated iron. They straggle irregularly over a large area of ground, entered at one end only, so that there is no making a circuit, but the visitor must come back the same way. The lack of altitude also means defective ventilation, which is at times so noticeable that it may well be expected to give the enemy occasion to blaspheme. With a ridge line 25 to 30 feet above ground and eaves not half that height, there is not proper facility for diffusion of heat and escape of products of combustion, and parties who want to make up a case against gas might get good material in various corners of the Exhibition, and thus avoid such dodges as burning 6 lights in a box about as many feet square and calling it an ordinary apartment. Some of the exhibitors complain of the effects of remaining in such an atmosphere for several hours, and as the show is open 11 hours daily without intermission, these defects become more prominent towards the close of the day. As the visitor returns home, satisfied but footsore, after a complete inspection, he may speculate as to what the effect would be if this really unique and magnificent collection of gas appliances could be housed under one roof of appropriate dimensions to cover the whole, and having galleries or other points of vantage for a birdseye view.

The Committee cannot be expected to include an Alladdin amongst its members, nor are suitable buildings to be met with to order, and therefore they had to make the best of the unpromising set of materials at their disposal. It is only fair to congratulate them on the skill and judgment displayed in the employment of red bunting, flags, shrubs and other decorations, with the result that a possible suite of rooms is provided, and the structural defects are concealed, or at least rendered less prominent. Indeed, the appearance is cheerful and attractive. There are three large halls all fully occupied, besides corridors and annexes, and there is also a large lecture hall with platform and other accommodation. The Committee of management include several engineers whose experience in promoting gas exhibits on former occasions has been fully applied in preventing anything like flatness or dullness. One of the finest military bands in the country discourses music at frequent intervals, and there are various short events in the

lecture hall in the way of 10-minute science lectures, quick cookery competitions, etc.

But you will naturally ask, what is the Exhibition doing, and what is it going to do? In the first place, it is a glorious republic for gas people of every grade of nationality. The working fitter or stoker is there, rubbing shoulders with merchant princes and chairmen of the largest undertakings. No other event has attracted such a gathering. Not only is the Scotch brogue and the Irish accent in continual evi dence, but foreign languages as well. The exhibitors and Committee appear to have agreed in promoting a feeling of hearty good fellowship. There is a private apartment for exhibitors and their friends, called the "Welcome" club, and the application of the sentiment goes a great deal further than the mere title. Directly any gas man, high or low, passes the turnstile, he cannot but feel the genial homelike influence and will go away feeling that a visit to Earl's Court is a recreation as well as a business. To one who has known the profession for 30 years or more the pleasure of meeting old friends and faces at every crook and corner is such that Earl's Court may well be called the gas engineers' paradise.

With regard to the general public, it is not possible to speak with so much confidence, but as far as one can judge, there has been a good attendance of the right class. There is a general feeling of surprise at the extent and importance of the industry, as revealed at the exhibition, and many who have been talking loudly about work for the unemployed, and supporting home industry, have been led to realize the fact that the gas companies employ a very large amount of artizan labor. Provincial gas companies are sending up parties of one particular branch such as the fitters or the stokers, in companies numbering 100 or more. But take a wider view, and include not only the visitors employed by the gas undertakings, but the employees in the various factories where the machinery, engines, gas works apparatus, meters, stoves and other appliances are turned out by the 1,000, aud we arrive at a proportion representing no inconsiderable fraction of the whole community. The public cannot make much out of thousands of millions of cubic feet of gas, but they would understand statistics as to the number of hands employed by gas undertakings, by engineers and contractors, and by manufacturers of apparatus.

Having glanced at what the exhibition is doing, it is neither advisable or necessary to go very deeply into what it is going to do, or in other words, what will be the after effects of all this labor and expense. Will they merely be a flash in the pan, or will they be a lasting bene fit? We may wait with confidence for the future to unfold the answer. It could be said, looking at the magnitude of the interests involved, that the gas industry has been over extravagant in advertising itself in the past. Good advertising of the right sort is always held to be judicious outlay, and it will be agreed that the Earl's Court show comes under such a description. I think that the historian of the future will say that the Gas Exhibition of 1904 was not only well designed and well managed, but that it was put forward at an appropriately opportune time.

But where is our old friend the flat flame burner? In 1882 the future of gas lighting was to some extent uncertain, and it was thought wise to bring up cookers and heaters as a second battalion, in case the foremost should collapse entirely. The chief feature then was combinations of large flat flame burners, and their effectiveness was sufficient to insure a fair amount of business in the absence of anything better. Various arrangements of so-called regenerator burners were also exhibited, which afforded a great improvement in the matter of "duty," but labored under the disadvantages of being costly, cumbersome and ugly, and extravagant as regards consumption of glass and etceteras. But these also possessed sufficient intrinsic merit to command a substantial share of public patronage. But now there is no question as to the future of gas lighting. The brilliant display at Earl's Court clears up every vestige of doubt on that point. Visitors are at once impressed with the fact that for cheapness and efficiency gas can give several points to its so-called rivals. But it is all done by means of the incandescent mantle, in a great variety of patterns, shapes and forms, with or without the aid of compressed air, and varying from a tiny globe suitable for a child's doll's house, up to the most powerful lighthouse illuminants known, anything from 5 to 5,000 or even 10,000-candle power can be provided to order. The inverted burner is in good evidence, and one firm supplies burners that can be placed at any angle, as easily as an electric glow lamp. But the mantle has completely displaced the recuperator, and the regenerator make is conspicuously absent, while the only flat flames to be seen are applied to the useful if not over creditable position of acting as the "awful example" on a burner testing bar attached to an experimental meter. With the material available in 1882 the lighting business would still have retained important proportions, but would never have extended to the satisfactory position now evidenced at Earl's Court, which is mainly due to the genius of Auer von Welsbach.

Great as the advance in respect to lighting during the 20 years has been it is more than equalled by the improvement in gas stoves. Comparing the exhibits of cookers, gas fires, and other appliances of 1904 with those of 1882 one cannot but be greatly impressed with the enormous expansion in all ways. Many of the firms now taking leading positions did not exist at the earlier period. The promoters of the show in 1882 can claim some share of credit in this connection, on account of the elaborate tests then carried out, which clearly laid down the lines on which economic and efficient gas heating and cooking are to be conducted. Nor is the development of the gas engine, during the same period less marked or important. Then there are several novelties that were not even dreamed of in 1882, of which the chief is the automatic meter. Barely 10 years have elapsed since this appliance sailed into the range of practical politics, and yet some companies have as many "slots" in use as ordinarys.

These are some of the facts that go to explain how it is that the invested capital, the sales of gas, and the number of consumers have all more than doubled during the past 20 years according to the official parliamentary returns and which are plainly put before the public in an elegant and attractive form by means of the exhibition at Earl's Court, London.

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE proprietors of the New Britain (Conn.) Gas Light Company very sensibly propose to extend their main system to the outlying districts of Newington and Berlin.

THE Consolidated Gas Company, of Long Branch, N. J., has notified the residents that hereafter the gross selling rate will be reduced from $1.60 to $1.50 per 1,000 cubic feet, prompt payment (within 10 days) to entitle the consumer to a rebate of 15 cents per 1,000. The reduction is virtually a concession of 10 cents per 1,000.

A CORRESPONDENT in Springfield, Mass., writing under date of the 24th December, says: "The Springfield Gas Light Company has determined to abolish the old system of quarterly payments, the new plan to take effect at the end of the present quarter. Now the Company has two systems in effect, one for monthly payments, the other for quarterly account, which naturally results in considerable confusion and bother that will be avoided by the adoption of an even plan. The Company has also uniformed all men whose duties oblige them at any time to enter upon the premises of consumers."

AN order has been issued by Chief Justice Shepard, of the Court of Appeals, District of Columbia, recalling the ridiculous mandate put out by the local Police Court in the case of the United States against Mr. Thomas F. Holden, Superintendent of the Washington Gas Light Company, who was "restrained in person" because the Washingtoh Company was polluting the Potomac river by means of using it (the river) as a take-off from the works. The Government seems bent on preserving the Potomac as a fishing preserve, and it has a hard job before it. However, Mr. "Tom" did not lose any sleep (or anything else) while he was "in restraint."

A CORRESPONDENT in Wilmington, N. C., writing under date of the 23d December, says: "The Consolidated Railway, Light and Power Company of this city has decided to make a reduction in the price of gas as a Christmas offering to the gas consumers of Wilmington. Now it is on account of the number of gas ranges thas have been installed in Wilmington in the last year or two, thus greatly increasing the sale of gas, that the Consolidated Company is enabled to make this reduction. From now on the price of illuminating gas will be $1.65 ihstead of $1.70 per 1,000 feet; and the price for fuel gas will be $1.25 instead of $1.30 per 1,000 feet. Five years ago, when the Company first started pushing the sale of gas stoves, gas was sold in Wilmington at $2 per 1,000, so that the total reduction so far due to the gas range is 35 cents per 1,000 on illuminating gas and 75 cents per 1,000 on fuel gas. Wilmington has not been behind the rest of the country in the adoption of gas as a fuel. There are now 500 gas ranges in use in this city, as well as many other fuel gas appliances. In a year or two there will hardly be a home in Wilmington that does not cook with gas, for the range is a household necessity and no home is complete without one."

In the reorganization of the Fishkill and Matteawan (N.Y,) Gas Company the chief executive officers named were: President, George O. Burns; Secretary and Treasurer, John B. Elmsdorf.

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The Common Council of Battle Creek, Mich., has instructed the City Attorney to draft an amendment to the city charter, to be presented at the coming session of the State Legislature, permitting the city to build and operate a gas plant on municipal account.

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"M. R. M.," writing from Washington, D. C., under date of December 24th, incloses the following: "In accordance with a custom established some years ago, Mr. John R. McLean, President of the Washing ton Gas Light Company, made a personal Christmas gift to the members of the local fire department yesterday afternoon. Mr. W. F. Hart, who acted as the distribnting agent for Mr. McLean, accompanied by Rollins Hume and 'Chief' Billy Madigan, started from the office of the Company at 1:30 o'clock in an automobile and visited every engine house in the District and presented each of the firemen attached to the Company with a $5 gold piece. The Deputy Chief Engineer and each of the Batallion Chiefs were presented with $20 gold pieces. It took Mr. Hart until 5:30 o'clock to complete the rounds."

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Advices by way of New Brunswick, N. J., dated last week, are to the effect that although the proposition of the Public Service Corporation of New Jersey to lease the business of the New Brunswick Light, Heat and Power Company was favorably considered at the meeting of the shareholders held a day or two ago, President J. Bayard Fitzpatrick subsequently stated that no decisive steps had been taken and that the final settlement of the matter would not be effected till the next meeting os the shareholders, which will be likely to be heid early in January. The proposal is to lease the plant for 999 years, with the understanding that the Public Service Corporation shall pay rental equal to a dividend of 2 per cent. for the first 2 years, viz., 1905 and 1906; 2½ for the next 2 years; 3 for the next 2 years; 3½ for the next 2 years; 4 for the next year; 4½ for the next year; and 5 for the next and succeeding years."

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Wildwood by-the Sea, N. J., is said to be anxious to have a gas works "in its midst." If it has one soon we imagine it will have to be constructed by the people who are interested in developing the land speculation, and not by "foreign" capitalists.

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The by-law to appropriate $400,000 for the construction or purchase of a municipal gas plant for Winnipeg, B. C., does not seem to have secured the necessary three-fifths vote.

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Work on the distributing plant for Palo Alto, Cal., is underway. The gas is to be piped from the United Gas and Electric Company's station at Redwood City, Cal.

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The City Council of Bonham, Tex., has granted certain Houston capitalists the right to construct and operate a gas plant in Bonham.

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The Directors of the Albion (Mich.) Gas Light Company have declared a dividend of 5 per cent., payable half in January and half in July.

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A correspondent in New York city, writing under date of the 24th December, says: "I notice that you failed to make any mention of the entertainment and reception recently given at Terrace Garden, New York city, by the members of the Gas Companies Employees' Mutual Aid Society. I think your paper should give greater prominence to these matters than it usually does, for in the rank and file you have many readers. The Society is one of the most successful of the mutual benefit associations in Manhattan and the Bronx. The members pay 50 cents per month and when a death occurs the Society pays to the family of the deceased member the sum of $300. They also pay 1 cent per day, and in the event of sickness the Society pays the member $6 per week for 12 weeks, and furnishes, free, medical attendance and medicines. Since its organization the Society has paid $65,000 in death claims and sickness benefits. It has now in its treasury $25,000. For every dollar contributed by the members, the Consolidated Company and its allied Companies contribute 50 cents, and they also pay the doctor bills and supply medicines."

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Messrs. Redmond & Co., of New York, are offering $500,000 Consolidated New York and Westchester Lighting Company general mortgage 4 per cent. gold bonds, issued by the New York and Westchester Lighting Company and assumed by the Consolidated Gas Company, of New York, by indorsement on each bond. The offering price is 93.

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At the special election recently held in Cedar Falls, Ia., to determine whether or not a franchise for the construction and operation there of a gas works; the proposition was indorsed by a good, round majority.

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Mr. A. L. Chisholm incloses the following from Boston: "Some days ago the Board of Gas and Electric Light Commissioners gave a hearing at the State House on the petition of the Cambridge Gas Light Company for authority to issue additional stock to the amount of $100,000. The new issue is to be devoted to the payment of expenses incurred by the Company in the construction of additions to its property. A. E. Pillsbury, former Attorney-General, represented the Company, while the Treasurer and Superintendent testified to the need of additional funds. There was no opposition."

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Mr. Frank M. Tait, having completed his labors at New London, Conn., has returned to Dayton, O., where he will manage the local lighting plant.

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At the annual meeting of the shareholders in the Rockland (Me.) United Gas and Electric Company, the officers chosen were: Directors, Albert Wallace and George E. Wallace, Rochester, N. H.; John Kibbel, Dover, N. H.; Charles B. Davis, Boston, New England Manager of the General Electric Company; George E. Macomber, Augusta; J. Frank Lang, Portland; and H. L. Shepherd, of Rockport. At a meeting held immediately after, the Board of Directors elected Albert Wallace, President; George G. Welch, Dover, N. H., Treasurer; and Thomas Hawken, of Rockland, General Manager.

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Mr. John Craig Hammond, Manager of the Advertising Department of the Denver (Col.) Gas and Electric Company, in announcing the result of the last word contest carried out by his department, had this to say: First, we want to thank you for the interest you took in the word contest on "Genuine Gas Coke." Thousands of answers were received, many coming from all parts of the country. The judges went over the highest lists with all possible care and announce the following winners: First prize, $50, Miss Esther Rosenberg, 1011 23d street, 5,323 words; second prize, $25, Carl Koehler, 902 Larimer street, 5,268 words; third prize, $10, Mrs. Chas. A. Rose, 2844 West 36th avenue, 4,938 words. The best suggestion for making "Genuine Gas Coke" the most popular fuel in Denver, was divided among 5 persons, each one being presented with a check for $5. They are: Chas. H. Scoggins, 702 27th street; Chas. L. Bryson, 1427 York street; S. C. Fulton, 1264 Columbine street; Eleanor T. Prentiss, 1951 Lincoln avenue; Wm. A. Turner, 1249 South 15th street. Of course, it was impossible for everyone to win—we are sorry for this. Many persons devoted much time and took great care in preparing their lists. We take it that those who did not win did not waste their time—it was a most interesting and instructive search for words. This Company hopes to deserve, win and keep the goodwill of the residents of Denver. This Company also wants to take this chance to suggest that "Genuine Gas Coke" has no superior for fuel in the furnace, grate or base burner. A trial will demonstrate that this claim is based on facts. Watch for the "ads." of the Gas Company in the daily papers. From time to time other contests that will prove of mutual value to the residents of Denver and to us will be announced.

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Recent advices from Clarksville, Tenn., are to the effect that Mr. J. H. Fall, President of the Clarksville Gas Company, has sold a portion of his stock to citizens in Clarksville, who will hereafter be interested with him in that project. Mr. Fall will continue as President of the Company, and S. L. Lowe as Secretary and Treasurer. He will also manage the property. There will be no change in the policy of the Company. The Company hopes to make extensions and improvements as fast as the business will justify.

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Mr. George S. Tibbits, who has had charge of the electric division of the Madison County (N. Y.) Gas and Electric Company's business in Canastota for a number of years, has resigned from its service. He would serve the Company, but the Company would not serve him.

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The annual meeting of the New Haven (Conn.) Gas Light Company will be held to-morrow.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

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OHIO GAS LIGHT ASSOCIATION.

NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
*Germany*—Lemcke & Buechner, of New York.
*England*—Aug. Siegle, 30 Lime Street, London.

MONDAY, JANUARY 2, 1905.

## The Market for Gas Securities.

The professional dealers in Consolidated gas had all things their way in the trading last week, and while the net result was about an even thing for the time under review, in the mid-interim the stock showed considerable strength. The celebrated case of the disinterested (?) gentlemen who think New York Borough has agreed to pay too much for her public lighting against the various lighting companies of the city will be tried in New York county instead of Kings county, which looks fair on its face. The inquiry for bonds continues lively. Consolidated closed at 199½ to 200.

Brooklyn Union sold up to 210 during the week, and the closing to-day (Friday) was 205 to 212. The stock is very cheap at those figures. Peoples, of Chicago, is strong. Baltimore Consolidated is offered at 86, and Washington (D. C.) is 320 bid. The Public Service Corporation (of New Jersey) underlying securities are all in good demand.

## Gas Stocks.

**Quotations by George W. Close, Broker and Dealer in Gas Stocks.**

16 WALL STREET, NEW YORK CITY.

JANUARY 2.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

| *N. Y. City Companies.* | *Capital.* | *Par.* | *Bid.* | *Asked.* |
|---|---|---|---|---|
| Consolidated | $73,177,000 | 100 | 199½ | 200 |
| Central Union, Bonds, 5's | 3,000,000 | 1,000 | 108½ | 110 |
| Equitable Bonds, 6's | 1,000,000 | 1,000 | 105 | .. |
| " 1st Con. 5's | 2,300,000 | 1,000 | 118 | 120 |
| Mutual | 3,500,000 | 100 | 300 | 320 |
| Municipal Bonds | 750,000 | .. | .. | .. |
| New Amsterdam Gas Co.. | | | | |
| Bonds, 5's | 11,000,000 | 1,000 | 112 | 113¼ |
| New York & Richmond Gas Co. (Staten Island) | 1,500,000 | 100 | 35 | . |
| 1st Mtg. Gold Bds. 5 p. ct. | 1,000,000 | .. | . | .. |
| Northern Union, Bonds, 5's. | 1,250,000 | 1,000 | 104 | 106 |
| New York and East River.. | | | | |
| Bonds 1st 5's | 3,500,000 | 1,000 | 112 | 114 |
| " 1st Con. 5's | 1,500,000 | .. | 106½ | 108½ |
| Standard | 5,000,000 | 100 | 125 | 130 |
| Preferred | 5,000,000 | 100 | 145 | 155 |
| Bonds, 1st Mortgage, 5's | 1,500,000 | 1,000 | 116 | 117 |
| Yonkers | 299,650 | 500 | 130 | .. |
| *Out-of-Town Companies.* | | | | |
| Brooklyn Union | 15,000,000 | 100 | 205 | 2 |
| " " Bonds (5's) | 15 000,000 | 1,000 | 113 | 115 |
| Bay State | 50,000,000 | 50 | — | — |
| " Income Bonds | 2,000,000 | 1,000 | .. | 75 |
| Binghamton Gas Works | 450,000 | 100 | 28 | 30 |
| " 1st Mtg. 5's | 509,000 | 1,000 | 93 | 96 |
| Boston United Gas Co.—1st Series S. F. Trust | 7,000,000 | 1,000 | 82 | 85 |
| 2d " " " | 3,000,000 | 1,000 | 47½ | 50 |
| Buffalo City Gas Co. | 5,500,000 | 100 | 5 | 5¾ |
| " " Bonds, 5's | 5,250,000 | 1,000 | 66 | 68½ |
| Capital, Sacramento | 500,000 | 50 | .. | 55 |
| Bonds (6's) | 150,000 | 1,000 | .. | .. |
| Chicago Gas Co. Guaranteed Gold Bonds | 7,650,000 | 1,000 | 104 | 104¼ |
| Cincinnati Gas and Electric Co | 29,500,000 | 100 | 107½ | 108 |
| Columbus (O.) Gas Co., 1st Mortgage Bonds | 1,500,000 | 1,000 | 97½ | 99 |
| Columbus (O.) Gas Lt. & Heating Co | 1,682,750 | 100 | 88¼ | 89½ |
| Preferred | 3,026,500 | 100 | 107½ | 109 |
| Consumers, Toronto | ,000,000 | 50 | 200 | 204 |
| Consolidated, Baltimore | 11,000,000 | 100 | . | 86 |
| Mortgage, 6's | 3,600,000 | .. | .. | 118 |
| Chesapeake, 1st 6's | 1,000,000 | .. | .. | .. |
| Equitable, 1st 6's | 910,000 | .. | .. | .. |
| Consolidated, 1st 5's | 1,490 000 | .. | .. | 112 |
| Consolidated Gas Co. of N. J. | 1,000,000 | 100 | 15 | 17 |
| " Con. Mtg. 5's | 880,000 | 1,000 | 89½ | 92 |
| Bonds | 75,000 | .. | .. | 100 |
| Detroit City Gas Co | 4,825,500 | 50 | .. | 50 |
| " Prior Lien 5's | 5,603,000 | 1,000 | 99½ | 100 |
| Detroit Gas Co., 5's | 361,000 | 1,000 | 75 | 75¼ |
| " Inc. 5's | 16,000 | 100 | 98½ | 100 |
| Equitable Gas & Fuel Co., Chicago, Bonds | 2,000,000 | 1,000 | .. | 101 |
| Essex and Hudson Gas Co. | 6,500,000 | .. | 39 | 40 |
| Fort Wayne | 2,000,000 | .. | .. | .. |
| " Bonds | 2,000,000 | .. | 55 | .. |
| Grand Rapids Gas Lt. Co. 1st Mtg. 5's | 1,325,000 | 1,000 | 104½ | 105 |
| Hartford | 750,000 | 25 | 190 | 200 |
| Hudson County Gas Co., of New Jersey | 10,500,000 | .. | 104½ | 105½ |
| " Bonds, 5's | 10,500,000 | .. | 107 | 108 |
| Indianapolis | 2,000,000 | .. | 70 | 75 |
| " Bonds, 6's | 2,550,000 | .. | 106½ | 108 |
| Jackson Gas Co | 250,000 | 50 | 82 | .. |
| " 1st Mtg. 5's | 290,000 | 1,000 | 101 | 102½ |
| Kansas City Gas Light Co., of Missouri | 5,000,000 | 100 | .. | 36 |
| Bonds, 1st 5's | 3,822,000 | 1,000 | 102 | 104 |
| Laclede, St. Louis | 10,000,000 | 100 | .. | .. |
| Preferred | 2,500,000 | 100 | 90 | .. |
| Bonds | 10,000,000 | 1,000 | 108½ | 109 |
| Lafayette Gas Co., Ind. | 1,000,000 | 100 | .. | 60 |
| Bonds | 1,000,000 | 1,000 | 60 | 65 |
| Louisville | 2,570,000 | 50 | 136 | 140 |
| Madison Gas & Elec. Co. | | | | |
| " 1st Mtg. 6's | 350,000 | 1,000 | 107½ | 108¼ |
| " 6 per cent. scrip, due 1910 | 100,000 | 25 | 85 | 87 |
| Montreal, Canada | 2,000,000 | 100 | 218 | 218¾ |
| Nashville Gas Lt. Co. | 1,000,000 | 100 | 110 | .. |
| Newark, N. J., Con. Gas Co. | 6,000,000 | .. | 56 | 58 |
| Bonds, 6's | 4,600,000 | .. | 105 | 105¾ |
| New Haven | 2,000,000 | 25 | 200 | ... |
| Peoples G. L. & Coke Co., of Chicago | 25,000,000 | 100 | 107⅞ | 107½ |
| Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage | 20,100,000 | 1,000 | .. | .. |
| 2d " | 2,500,000 | 1,000 | 104 | |
| Rochester Gas & Elec. Co.. | 2,150,000 | 50 | 88 | .. |
| Preferred | 2,150,000 | 50 | 118 | .. |
| Consolidated 5's | 2,000,000 | .. | 87½ | 90 |
| San Francisco, Cal. | 15,800,000 | 100 | 58½ | 58¾ |
| St. Joseph Gas Co. | | | | |
| " 1st Mtg. 5's | 751,000 | 1,000 | 94 | 96 |
| St. Paul Gas Light Co | 1,500,000 | 100 | 45 | 47 |
| 1st Mortgage 6's | 650,000 | 1,000 | 113 | 116 |
| Extension, 6's | 600,000 | 1,000 | 113½ | 115 |
| General Mortgage, 5's | 2,465,000 | 1,000 | 92 | 93 |
| Syracuse, N. Y. | 1,975,000 | 100 | 50 | 55 |
| Bonds | 2,047 000 | 1,000 | 102 | . |
| Washington, D. C | 2,600,000 | 20 | 320 | 325 |
| First mortgage 6's | 600,000 | .. | .. | .. |
| Western, Milwaukee | 4,000,000 | .. | .. | .. |
| Wilmington, Del. | 600,000 | 50 | 230 | .. |

## Advertisers' Index.


**GAS ENGINEERS.** Page

A. E. Boardman, New York City ... 16
Baxter & Young, Detroit, Mich ... 32
B. E. Chollar, St. Louis, Mo ... 18
David Leavitt Hough, New York City ... 32
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 24
Frank D. Moses, Trenton, N. J ... 17
Fred. Bredel Co., Milwaukee, Wis ... 20
Frederic Egner, Washington, D. C ... 18
Geo. G. Ramsdell, New York City ... 1017
Geo. R. Rowland, New York City ... 24
Humphreys & Glasgow, New York City ... 33
Isbell-Porter Co., Newark, N J ... 34
J. Alex. Mayers, New York City ... 35
J. F. W. Jost, Philadelphia, Pa ... 21
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 32
The Gas Machinery Co., Cleveland, O ... 20
The Jeffrey Manufacturing Co., Columbus, O ... 30
The Western Gas Construction Co., Fort Wayne, Ind ... 1040
United Gas Improvement Co., Philadelphia, Pa ... 27

**GAS WORKS APPARATUS AND CONSTRUCTION.**

A. E. Boardman, New York City ... 16
Bartlett, Hayward & Co., Baltimore, Md ... 33
Baxter & Young, Detroit, Mich ... 32
Connelly Iron Sponge and Governor Co., New York City ... 29
Continental Iron Works, Brooklyn, N. Y ... 34
Cruse-Kemper Co., Philadelphia, Pa ... 29
Davis and Farnum Mfg. Co., Waltham, Mass ... 32
Deily & Fowler, Philadelphia, Pa ... 36
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 24
Empire Gas Construction & Improvement Co., N. Y. City 19
Frank D. Moses, Trenton, N. J ... 17
Fred. Bredel Co., Milwaukee, Wis ... 20
G. Shepard Page's Sons, New York City ... 32
Humphreys & Glasgow, New York City ... 32
Isbell-Porter Company, New York City ... 34
J. Alex. Mayers, New York City ... 35
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 32
Lloyd Construction Co., Detroit, Mich ... 22
Logan Iron Works, Brooklyn, N. Y ... 33
Quintard Iron Works, New York City ... 33
R. D. Wood & Co., Philadelphia, Pa ... 34
Riter-Conley Mfg. Co., Pittsburg, Pa ... 35
Stacey Mfg. Co., Cincinnati, O ... 25
The Connersville Blower Company, Connersville, Ind. 37
The Gas Machinery Co., Cleveland, O ... 20
The Jeffrey Manufacturing Co., Columbus, O ... 30
The Western Gas Construction Co., Fort Wayne, Ind ... 1040
United Gas Improvement Co., Philadelphia, Pa ... 27

**PROCESSES.**

Bartlett, Hayward & Co., Baltimore, Md ... 33
B. E. Chollar, St. Louis, Mo ... 18
Economical Gas Apparatus Construct'n Co, Toronto, Ont. 24
Fred. Bredel Co., Milwaukee, Wis ... 20
Humphreys & Glasgow, New York City ... 33
The Gas Machinery Co., Cleveland, O ... 20
The Western Gas Construction Co., Fort Wayne, Ind ... 1040
United Gas Improvement Co., Philadelphia, Pa ... 27

**SCRUBBERS AND CONDENSERS.**

Continental Iron Works, Brooklyn, N. Y ... 34
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 24
Fred. Bredel Co., Milwaukee, Wis ... 20
Isbell-Porter Co., Newark, N. J ... 34
Kerr Murray Mfg. Co , Fort Wayne, Ind ... 32
Logan Iron Works, Brooklyn, N. Y ... 36
R. D. Wood & Co., Philadelphia, Pa ... 34
Riter-Conley Mfg. Co., Pittsburg, Pa ... 35
Stacey Mfg. Co., Cincinnati, O ... 35
The Gas Machinery Co., Cleveland, O ... 20
The Western Gas Construction Co., Fort Wayne, Ind ... 1040

**PRODUCER POWER PLANTS.**

Economical Gas Apparatus Construct'n Co., Toronto, Ont. 24
R. D. Wood & Co., Philadelphia, Pa ... 34

**TAR AND CARBONIC ACID EXTRACTOR.**

Economical Gas Apparatus Construct'n Co., Toronto, Ont. 24
Fred. Bredel Co., Milwaukee, Wis ... 20
Isbell-Porter Co.. Newark, N. J ... 34
Stacey Mfg. Co., Cincinnati, O ... 35
The Gas Machinery Co., Cleveland, O ... 20
The Western Gas Construction Co., Fort Wayne, Ind ... 1040

**AMMONIA CONCENTRATORS.**

Fred. Bredel Co., Milwaukee, Wis ... 20
Michigan Ammonia Works, Detroit, Mich ... 15
The Gas Machinery Co., Cleveland, O ... 20
The Western Gas Construction Co., Fort Wayne, Ind ... 1040

**GAS METERS.**

American Meter Co., New York and Philadelphia ... 39
Detroit Meter Company, Detroit, Mich ... 1039
D. McDonald & Co., Albany, N. Y ... 37
Helme & McIlhenny, Philadelphia, Pa ... 30
John J. Griffin & Co., Philadelphia, Pa ... 40
Keystone Meter Co., Royersford, Pa ... 38
Maryland Meter and Mfg. Co., Baltimore, Md ... 38
Metric Metal Co., Erie, Pa ... 39
Nathaniel Tufts Meter Co., Boston, Mass ... 38

### PREPAYMENT METERS.

American Meter Co., New York and Philadelphia..... 39
D. McDonald & Co., Albany, N. Y..... 37
Helme & McIlhenny, Philadelphia, Pa..... 39
John J. Griffin & Co., Philadelphia, Pa..... 40
Keystone Meter Co., Royersford, Pa..... 38
Nathaniel Tufts Meter Co., Boston, Mass..... 38

### PREPAYMENT METER ATTACHMENTS.

Reeves Mfg. Co., New Haven, Conn..... 19

### GAS AND WATER PIPES.

Central Foundry Co., New York City..... 24
Charles Millar & Son Co., Utica, N. Y..... 24
Davi & Farnum Mfg. Co., Waltham, Mass..... 32
Donaldson Iron Co., Emaus, Pa..... 24
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 24
R. D. Wood & Co., Philadelphia, Pa..... 34
Warren Foundry and Machine Co., New York City..... 24

### GAS COALS.

Berwind-White Coal Mining Co., New York and Phila. 30
Perkins & Co., New York City..... 30
Westmoreland Coal Co., Philadelphia, Pa..... 31

### SPECIALTIES FOR OIL AND PIPE LINES.

S. R. Dresser, Bradford, Pa..... 21

### GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N.Y. City..... 24

### MAIN AND SERVICE LAYING.

Sullivan Bros., Flushing, N. Y.....1029

### GAS TAPPING MACHINES.

George Light, Dayton, O..... 24
H. Mueller Manufacturing Company, Decatur, Ills..... 22

### CANNEL COALS.

Perkins & Co., New York City..... 30

### STOKING MACHINERY.

G. A. Bronder, New York City..... 29

### CONVEYORS.

Adam Weber Sons, New York City..... 28
C. W. Hunt Company, New York City..... 30
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 24
Fred. Bredel Co., Milwaukee, Wis..... 20
G. A. Bronder, New York City..... 29
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 32
The Brown Hoisting Machinery Co., Cleveland, O..... 31
The Gas Machinery Co., Cleveland, O..... 20
The Jeffrey Manufacturing Co., Columbus, O..... 30
The Link-Belt Engineering Co., Philadelphia, Pa..... 21
The Link-Belt Machinery Co., Chicago, Ills..... 24
The Western Gas Construction Co., Fort Wayne, Ind...1040

### CHARGING BARROWS & COAL WAGONS.

Kerr Murray Mfg. Co., Fort Wayne, Ind..... 32
Stacey Mfg. Co., Cincinnati, O..... 45

### GAS ENRICHERS.

Standard Oil Co., New York City.....1031
Sun Company, Pittsburg, Pa..... 31
The Sun Oil Co., Pittsburg, Pa..... 31

### COKE CRUSHERS.

C. M. Keller, Columbus, Ind..... 31
Fred. Bredel Co., Milwaukee. Wis..... 20
The Jeffrey Manufacturing Co., Columbus, O..... 30

### STEAM BLOWER FOR BURNING BREEZE.

The Connersville Blower Company, Connersville, Ind.. 37

### ECONOMIZERS.

Green Fuel Economizer Co., Matteawan, N.Y..... 19

### GAS GAUGES.

The Bristol Co., Waterbury, Conn..... 28

### GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 29
Fred. Bredel Co , Milwaukee, Wis..... 20
Isbell-Porter Co., Newark, N. J..... 34
R. D. Wood & Co., Philadelphia, Pa..... 34

### CEMENTS.

C. L. Gerould, Bloomington, Ind..... 28

### RETORTS AND FIREBRICKS.

Adam Weber Sons, New York City..... 28
Baltimore Retort and Firebrick Co , Baltimore, Md..... 28
Brooklyn Firebrick Works, Brooklyn, N. Y..... 28
Harbison-Walker Refractories Co., Pittsburg, Pa..... 18
Henry Maurer & Son, New York City..... 28
James Gardner, Jr., Co., Pittsburg, Pa..... 28
J. H. Gautier & Co., Jersey City, N. J..... 28
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 28
Missouri Firebrick Co., St. Louis, Mo..... 28
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 18
The Kreischer Brick Mfg. Co., New York City..... 28

### INCLINED RETORTS.

Adam Weber Sons (Graham, Morton [England] System) 28
Fred. Bredel Co., Milwaukee, Wis..... 20
Geo. G. Ramsdell, New York City..... 1017
Parker-Russell Mining and Mfg. Co., St. Louis, Mo ..... 18

### VERTICAL S'S.

Adam Weber Sons (Oscar B. Weber's Construction)..... 28
Connelly Iron Sponge & Gov. Co. (Drake's [Eng.] System) 29
Fred. Bredel Co., Milwaukee, Wis..... 20
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 18

### VERTICAL RETORTS, CHARGING AND DISCHARGING VERTICALLY.

Adam Weber Sons, New York City..... 28

### REGENERATIVE FURNACES.

Ada n Weber Sons, New York City..... 28
Bartlett, Hayward & Co., Baltimore, Md..... 33
Fred. Bredel Co., Milwaukee, Wis..... 20
J. H. Gautier & Co., Jersey City, N. J..... 28
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 28
Missouri Firebrick Co., St. Louis, Mo. ..... 28
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 18

### SELF-SEALING MOUTHPIECE DOORS.

Continental Iron Works, Brooklyn, N.Y. ..... 34
Fred. Bredel Co., Milwaukee, Wis..... 20
Isbell-Porter Co., Newark, N. J..... 34
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 32
Logan Iron Works, Brooklyn, N.Y..... 36
R. D. Wood & Co., Philadelphia, Pa..... 34
Stacey Mfg. Co., Cincinnati, O..... 35
The Gas Machinery Co., Cleveland, O..... 20
The Western Gas Construction Co., Fort Wayne, Ind...1040

### CHIMNEY CONSTRUCTION.

Adam Weber Sons, New York City..... 28

### INCANDESCENT GAS LAMPS.

Central Lighting Co., New York City..... 17
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 21
General Gas Light Co., Kalamazoo, Mich..... 19
Geo. G. Ramsdell, New York City.....1017
Welsbach Company, Gloucester, N. J..... 26

### BURNERS.

Central Lighting Co , New York City ..... 17
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 21
Wm. M. Crane Co., New York City.. ..... 21

### LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn..... 21

### STREET LAMPS.

Thos. T. W. Miner, New York City..... 20
Welsbach Street Lighting Co., New York and Phila.... 26

### GAS FLASH SIGNS.

Qui-Vive Co., Grand Rapids, Mich..... 21

### PURIFIERS.

Connelly Iron Sponge and Governor Co., New York City. 29
Fred. Bredel Co., Milwaukee, Wis..... 20
Isbell-Porter Co., Newark, N. J..... 34
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 32
R. D. Wood & Co., Philadelphia, Pa..... 34
Stacey Mfg. Co., Cincinnati, O..... 35
The Western Gas Construction Co., Fort Wayne, Ind...1040

### PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 29

### VALVES.

Continental Iron Works, Brooklyn, N. Y..... 34
Economical Gas Apparatus Construct'n Co., Toronto, Ont 24
Isbell-Porter Co., Newark, N. J..... 34
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 32
Ludlow Valve Manufacturing Co., Troy, N.Y..... 21
R. D. Wood & Co., Philadelphia, Pa..... 34
Stacey Mfg Co., Cincinnati, O..... 35
The P. H. & F. M. Roots Co., Connersville, Ind..... 23
The Western Gas Construction Co., Fort Wayne, Ind... 1040

### EXHAUSTERS.

Connelly Iron Sponge and Governor Co., New York City 29
Isbell-Porter Company, Newark, N. J..... 34
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 32
The Connersville Blower Company, Connersville, Ind... 37
The P. H. & F. M. Roots Co., Connersville, Ind..... 23

### PURIFIER SCREENS.

John Cabot, Hoboken, N. J..... 20

### GRATE BARS.

F. Ferguson & Son, Hoboken, N. J..... 24

### GAS STOVES.

American Meter Co., New York and Philadelphia..... 39
Detroit Stove Works, Detroit and Chicago..... 38
Keystone Meter Co., Royersford, Pa..... 38
Maryland Meter and Manufacturing Co., Baltimore, Md. 34
Nathaniel Tufts Meter Co., Boston, Mass..... 38

### HOT WATER HEATERS.

Humphrey Co., Kalamazoo, Mich..... 20

### GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N.Y..... 28

### GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md..... 33
Continental Iron Works, Brooklyn, N.Y..... 34
Cruse-Kemper Co., Philadelphia, Pa..... 39
Davis & Farnum Mfg Co., Waltham, Mass..... 32
Deily & Fowler, Philadelphia, Pa..... 36
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 24
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 32
Logan Iron Works, Brooklyn, N.Y..... 36
R. D. Wood & Co., Philadelphia, Pa..... 34
Riter-Conley Mfg. Co., Pittsburg, Pa..... 35
Stacey Mfg. Co., Cincinnati, O..... 35

### STORAGE TANKS.

Stacey Mfg. Co., Cincinnati, O..... 35

### PAINTS.

American Standard Composition Co., New York City... 16
National Paint Works, New York City..... 32

### PATENTS, TRADE-MARKS, COPYRIGHTS.

Royal E. Burnham, Washington, D. C..... 20


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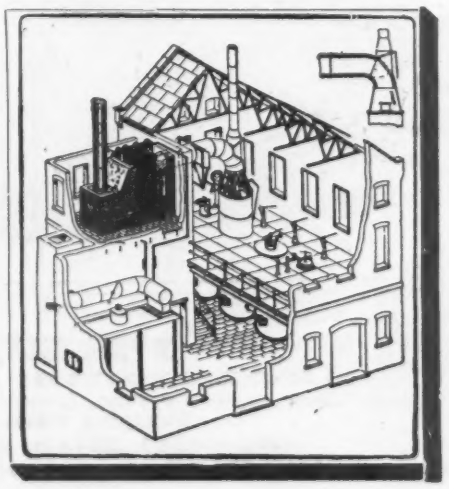

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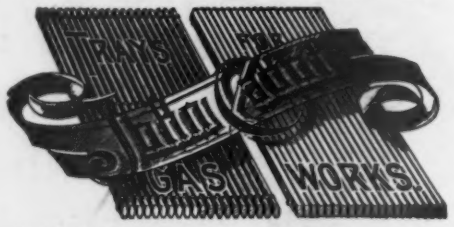


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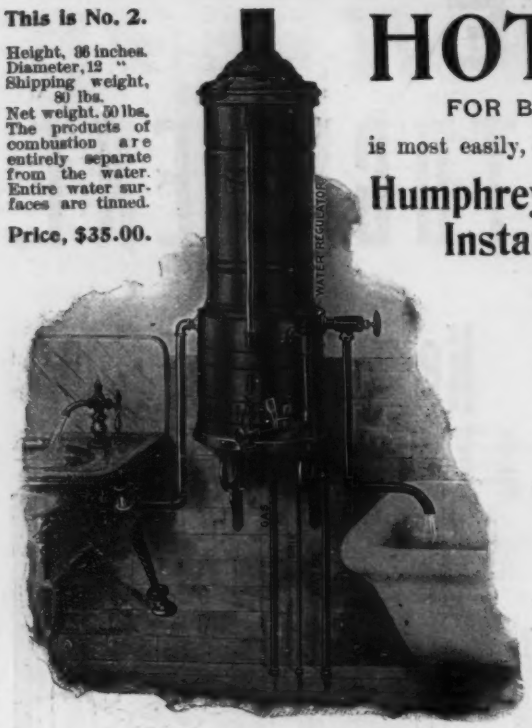


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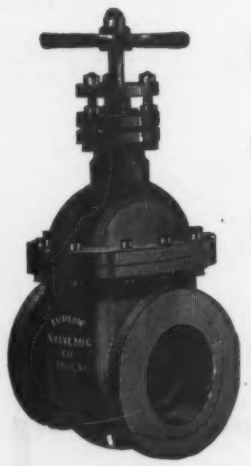

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Machinery consists of steel track hopper, 35' centers overlapping pan apron feeder, 3-roll coal crusher and 112' centers continuous bucket inclined elevator. The machinery handles run-of-mine bituminous coal at rate of 45 tons per hour.

"We owe no allegiance to a machine, but are loyal to successfu accomplishment"

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**Philadelphia.**

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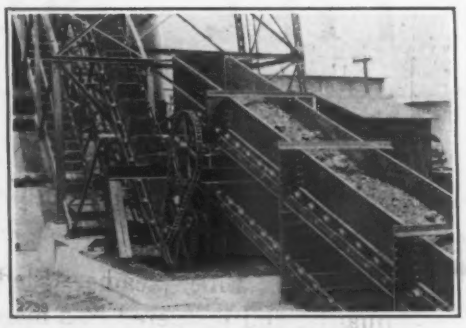

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CHEMICAL ENGINEER
—IN—
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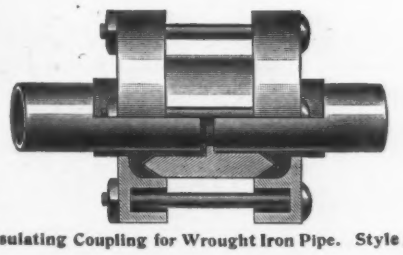
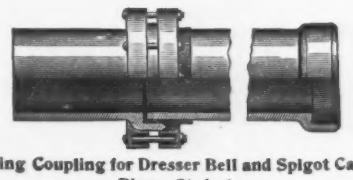
## S. R. DRESSER,

BRADFORD, PENNSYLVANIA, U. S. A.,

Patentee and Manufacturer of Specialties for Oil and Gas Lines.

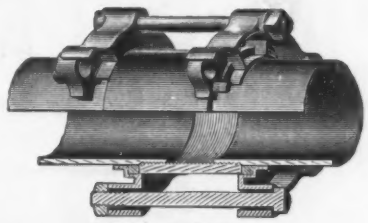


Insulating Coupling for Wrought Iron Pipe. Style 3.

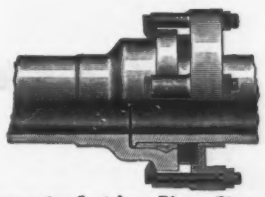


Insulating Coupling for Dresser Bell and Spigot Cast Iron Pipe. Style 6.

Regular Sleeve. Style 2.



Clamp. Style 4.



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Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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# ARE YOU MARRIED to any other burner?

If not, please give us an opportunity to get your orders. Tell us what your pressure is and we will send you samples which we know will please you. Steward Burners are made for 8-10, 12-10, 15-10, 20-10, 25-10 or 30-10 pressure, and in sizes from 2-foot to 8-foot.

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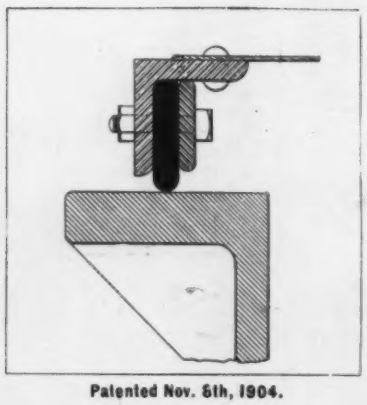
Hence

# Lloyd's Rubber Lute



Patented Nov. 5th, 1904.

being rigidly held, does not depend upon either its own elasticity in a groove nor upon an adhesive substance to keep it in place, and

LLOYD CONSTRUCTION CO.,
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# MUELLER PIPE REAMERS.

RATCHET HANDLE PATTERN.

C—035.

While it requires steel of good quality to make good reamer blades, it also requires good tempering to utilize the quality of the steel.

Mueller Pipe Reamer Blades are made of steel of good quality, and tempered in a manner to make the best use of its quality in the strength of the blade and the durability of its edge.

Mueller Pipe Reamers will ream any size of pipe, from ⅜ to 3-inch. They are made in plain handle and ratchet handle patterns. The reamer illustrated is the ratchet handle pattern.

Each reamer is carefully inspected and assembled, is given a test as near like actual service use as possible, bears the Mueller trade mark, and is *unconditionally guaranteed.*

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FOR WATER AND GAS.

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**GAS TAPPING MACHINES**

—FOR—

Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

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Size of Combination Drills and Taps ¾ to 4-inch.

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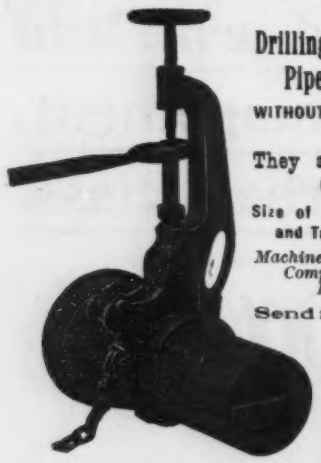

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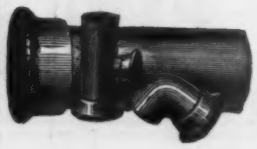

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FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

NO LEAKY JOINTS IN **UNIVERSAL PIPE.**

Specially adaptable for—
High and Low Pressure Gas Mains.
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CENTRAL FOUNDRY COMPANY, - - - 116 Nassau Street, New York City.

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Any size gas main can be shut off in 30 seconds. : : :

STOPPERS SENT ON TRIAL.

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**GRATE BARS**

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STATIONARY, SHAKING, DUMPING.

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ESPECIALLY ADAPTED FOR HANDLING

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Or any heavy or gritty materials, where strength and durability are essential. Constructed in any length or capacity, and to suit local conditions.

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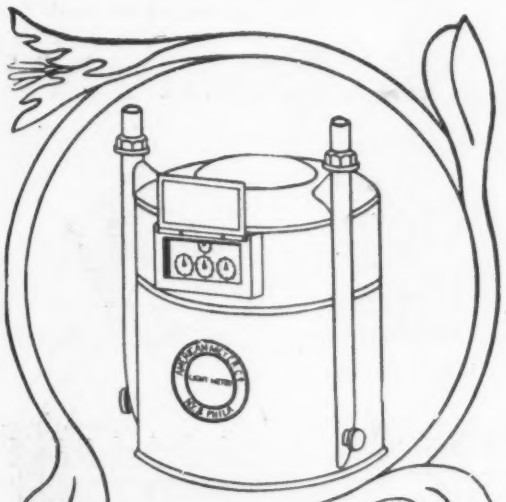

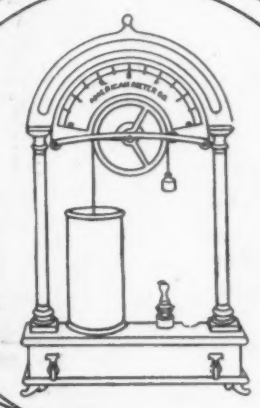

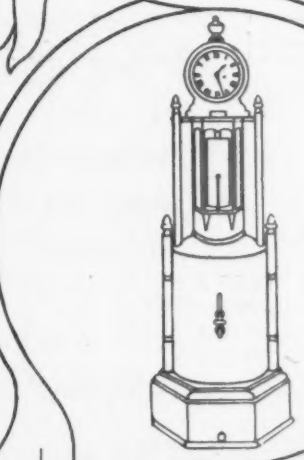

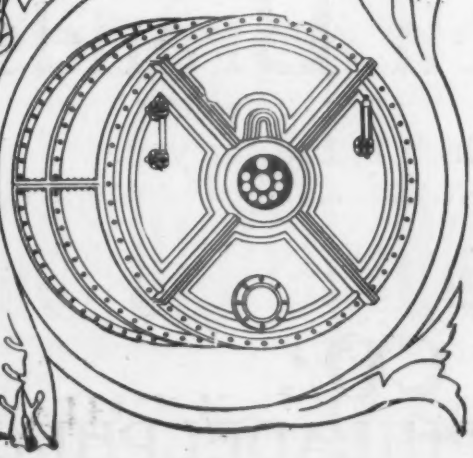

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CHICAGO,
ST. LOUIS,
SAN FRANCISCO.

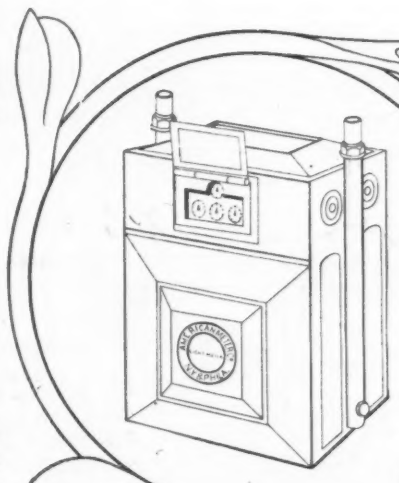
## PUBLIC LIGHTING TABLE.

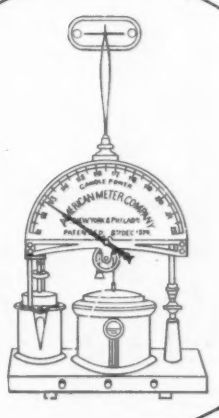
### JANUARY, 1905

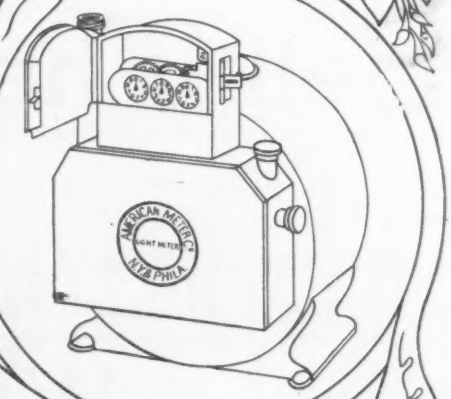
| Day of Week. | Table No. 1. Following the Moon. Date. | Light. | Extinguish | Table No. 2. New York City. All Night Lighting. Light. | Extinguish. |
|---|---|---|---|---|---|
| | | | | P.M. | A.M. |
| Sun. | 1 | 5.20 PM | 5.00 AM | 4.30 | 6.30 |
| Mon. | 2 | 5.20 | 6.20 | 4.30 | 6.30 |
| Tue. | 3 | 5.20 | 6.20 | 4.30 | 6.30 |
| Wed. | 4 | 5.20 | 6.20 | 4.30 | 6.30 |
| Thu. | 5 | 5.20 NM | 6.20 | 4.30 | 6.30 |
| Fri. | 6 | 5.20 | 6.20 | 4.30 | 6.30 |
| Sat. | 7 | 5.20 | 6.20 | 4.30 | 6.30 |
| Sun. | 8 | 5.20 | 6.20 | 4.40 | 6.30 |
| Mon. | 9 | 5.20 | 6.20 | 4.40 | 6.30 |
| Tue. | 10 | 8.50 | 6.20 | 4.40 | 6.30 |
| Wed. | 11 | 9.50 | 6.20 | 4.40 | 6.30 |
| Thu. | 12 | 10.40 | 6.20 | 4.40 | 6.30 |
| Fri. | 13 | 11.40 FQ | 6.20 | 4.40 | 6.30 |
| Sat. | 14 | 12.40 AM | 6.20 | 4.40 | 6.30 |
| Sun | 15 | 1.40 | 6.20 | 4.50 | 6.25 |
| Mon. | 16 | 2.30 | 6.20 | 4.50 | 6.25 |
| Tue. | 17 | 3.30 | 6.20 | 4.50 | 6.25 |
| Wed. | 18 | 4.30 | 6.20 | 4.50 | 6.25 |
| Thu. | 19 | No L. | No L. | 4.50 | 6.25 |
| Fri. | 20 | No L. FM | No L. | 4.50 | 6.25 |
| Sat. | 21 | No L. | No L. | 4.50 | 6.25 |
| Sun. | 22 | 5.40 PM | 8.00 PM | 5.00 | 6.25 |
| Mon. | 23 | 5.40 | 9.10 | 5.00 | 6.25 |
| Tue. | 24 | 5.40 | 10.20 | 5.00 | 6.25 |
| Wed. | 25 | 5.40 | 11.30 | 5.00 | 6.25 |
| Thu. | 26 | 5.40 | 12.40 AM | 5.00 | 6.25 |
| Fri. | 27 | 5.40 LQ | 1.50 | 5.00 | 6.25 |
| Sat. | 28 | 5.40 | 2.50 | 5.00 | 6.25 |
| Sun. | 29 | 5.50 | 3.50 | 5.05 | 6.15 |
| Mon. | 30 | 5.50 | 4.50 | 5.05 | 6.15 |
| Tue. | 31 | 5.50 | 6.10 | 5.05 | 6.15 |

## TOTAL HOURS LIGHTING DURING 1905.

| By Table No. 1. | Hrs.Min. | By Table No. 2. | Hrs.Min. |
|---|---|---|---|
| January | 240.50 | January | 423.20 |
| February | 192.20 | February | 355.25 |
| March | 207.00 | March | 355.35 |
| April | 175.10 | April | 298.50 |
| May | 161.00 | May | 264.50 |
| June | 139.50 | June | 234.25 |
| July | 149.00 | July | 243.45 |
| August | 161.50 | August | 280.25 |
| September | 173.00 | September | 321.15 |
| October | 205.00 | October | 374.30 |
| November | 211.00 | November | 401.40 |
| December | 229.00 | December | 433.45 |
| Total, yr. | 2245.00 | Total, yr. | 3987.45 |



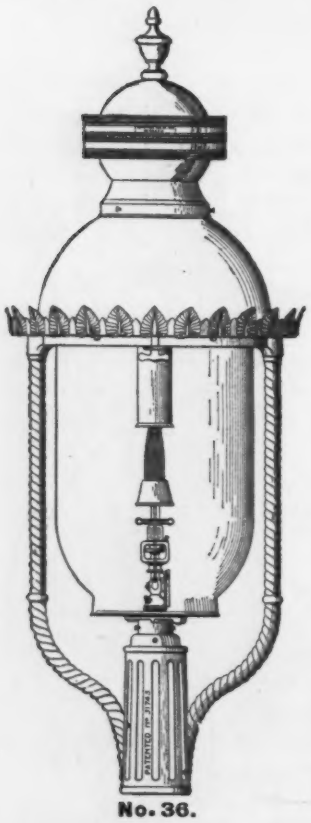




NEW YORK, 97 Liberty Street. BOSTON. 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

# WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 36.

Controls and Operates the

## Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

AN underlying principle in business is to show an increase each year---to grow. The astute dealer not only seeks to retain this year's customers, but to attract new trade next year.

The formula is simple---

THIS SHIELD IS THE WELSBACH TRADE MARK.

IT IS A GUARANTEE AND A PROTECTION.

# Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

The genuine Welsbachs---Burners or Mantles---make satisfied customers---keep customers---MAKE NEW ONES.

***And your profit isn't merely dollars and cents.***

## WELSBACH CO.,

**Broad and Arch Sts., PHILADELPHIA.**

# THE UNITED GAS IMPROVEMENT COMPANY

**For the Period Ending July 31st, 1904, has been Awarded Contracts in the Following Places for**

## Standard Double-Superheater Lowe Water Gas Apparatus.

Augusta, Me.
Bangor, Pa.
Woonsocket, R. I. (2d contract).
Brooklyn, N. Y. (4th contract).
Cincinnati, O. (2d contract).
Scranton, Pa. (3d contract).
New York City (14th contract).
New Haven Conn. (2d contract).
Watertown, N. Y.
Tampa, Fla. (3d contract).
Westchester, N. Y. (3d contract).
Bridgeport, Conn. (2d contract).
St. Paul, Minn. (2d contract).
Harrisburg, Pa.
Pelham, N. Y.
Reading, Pa.
Springfield, Mass. (2d contract).
Lynn, Mass. (5th contract).

TOTAL SETS, 1904, . . . . . 35
TOTAL DAILY CAPACITY, 1904, . . 50,400,000 cubic feet.
TOTAL SETS TO DATE, . . . . . 543
TOTAL DAILY CAPACITY, . . . 413,180,000 cubic feet.

## The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

**J. H. Gautier & Co.**

Greene & Essex Streets,
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CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

**Brooklyn Fire Brick Works,**

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MANUFACTURERS OF

CLAY GAS RETORTS & SETTINGS, GENERATOR LININGS. SPECIALTIES.

Established 1854. Incorporated 1869.

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**Fire Brick Manufg. Co.,**

Manufacturers of { GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Proprietors for the U. S., Coze System of Inclined Benches.

*Estimates Furnished on Application for Most Successful Style of Construction.*

Also for Free-Firing and Full and Half-Depth Regenerative Benches, for Burning either Coal or Coke in the Furnaces.

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Established 1845. Reorganized 1902.

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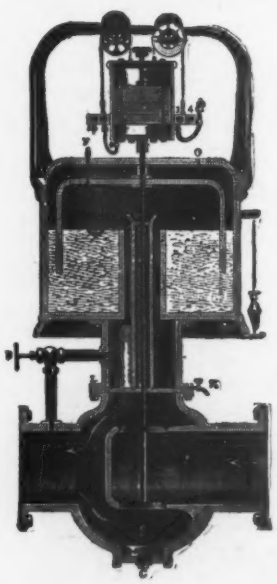

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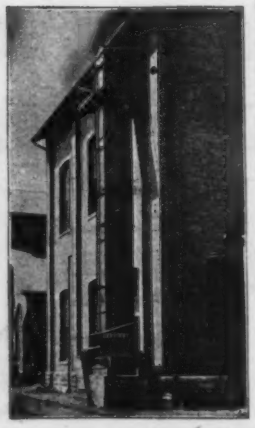

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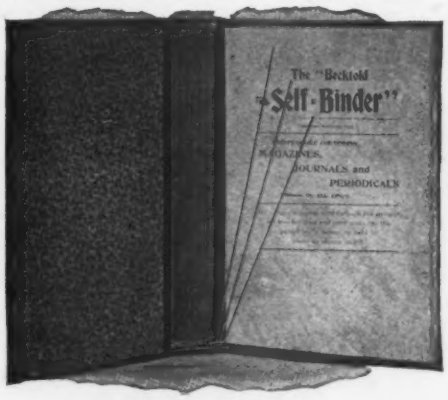


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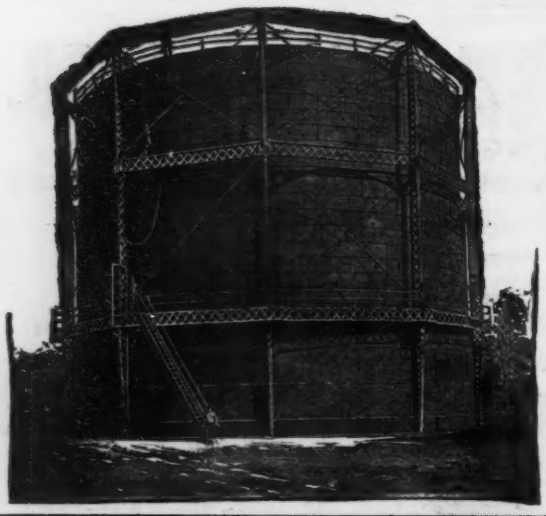

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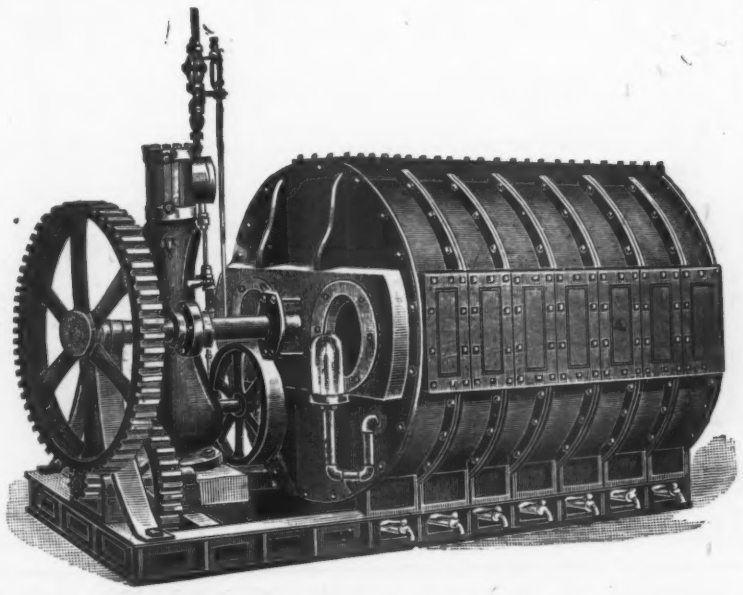

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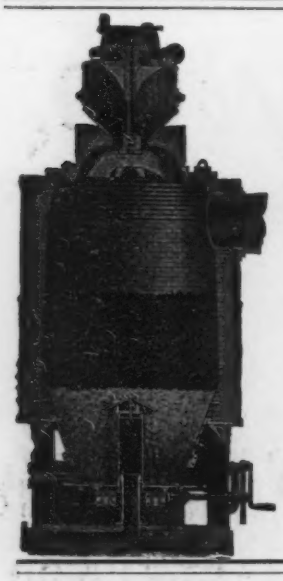

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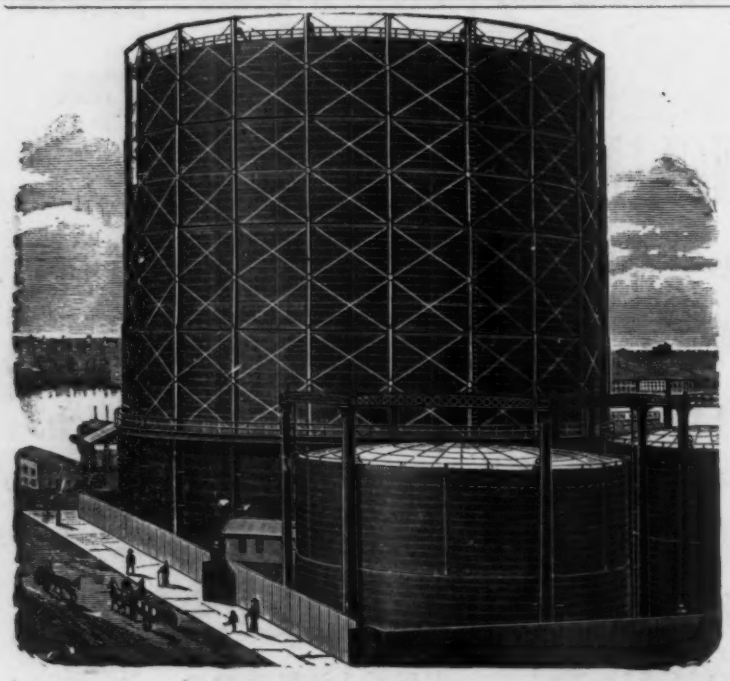

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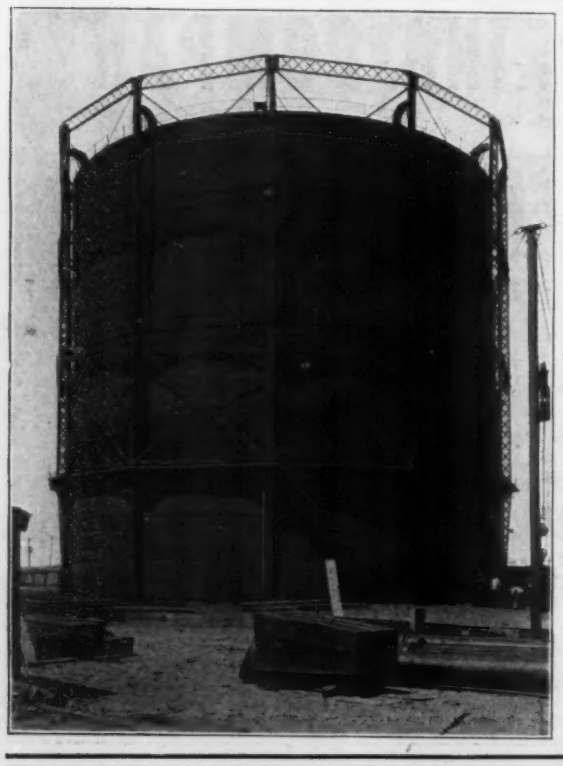

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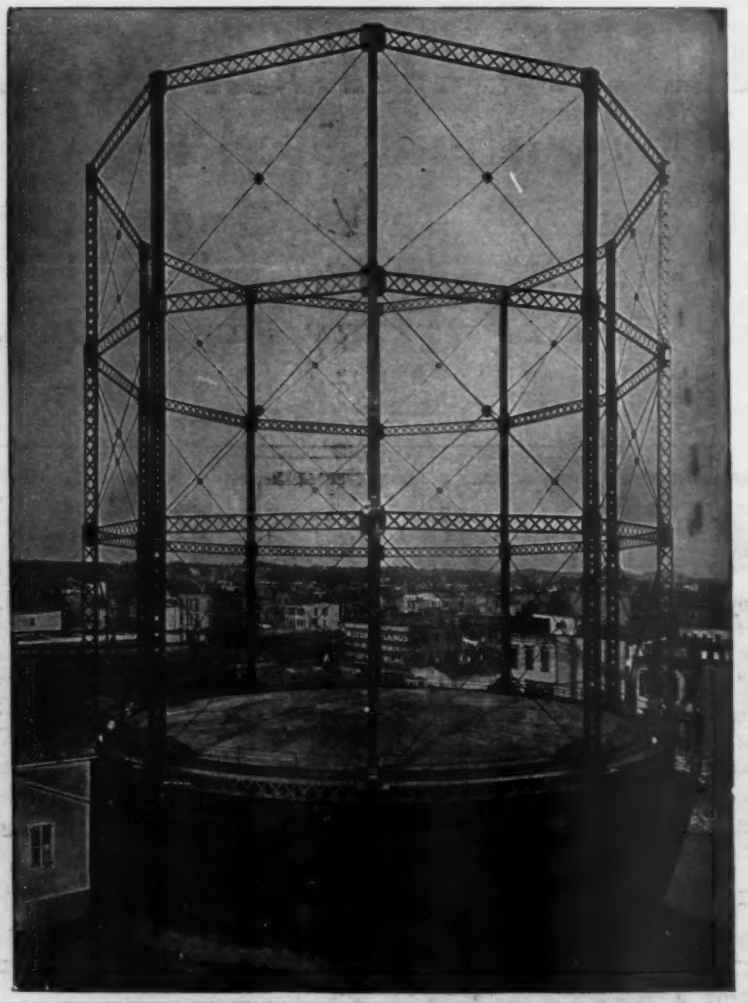

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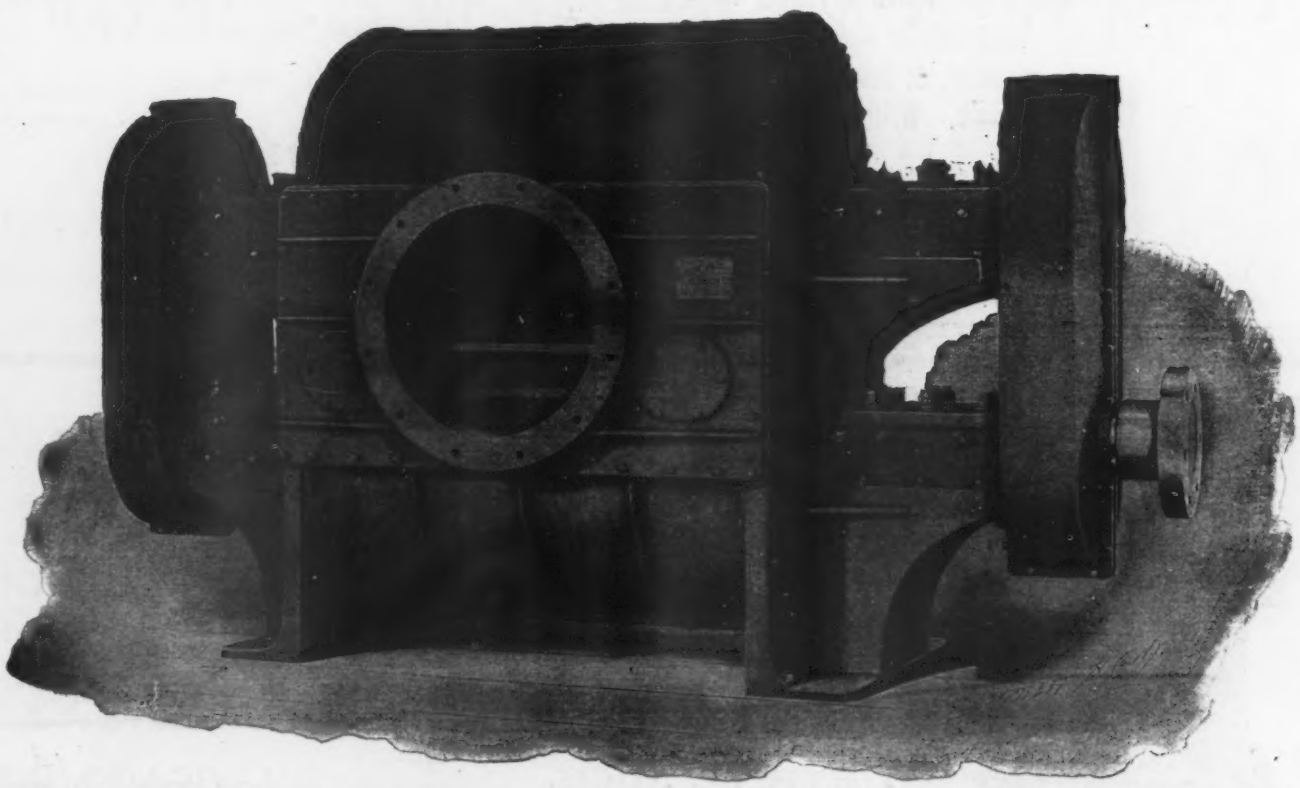

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**FACTORY AT ERIE, PA.**

## EXCERPTS FROM DECISIONS

—OF THE—

## BOARD OF GAS COMMISSIONERS of the COMMONWEALTH OF MASSACHUSETTS.

MR. E. H. YORKE, NEW HAVEN, CONN., Dec. 1, 1898.

Dear Sir:—I am in receipt of a copy of "Excerpts from the Decisions of the Board of Gas Commissioners," which is a handy compilation in book form of extracts from the most recent decisions of the Gas Commission of Massachusetts.

I note that most of these extracts are broad and safe-guiding precepts, which apply with equal force to one Company as to another. The 13 years' existence of the Board of Gas Commissioners with its unusual opportunities for acquiring information, have justly made it a high and safe authority in all matters pertaining to the management, obligations, and rights of Gas Companies. Your little book will serve as a valuable reference library in settling legal complications which often arise between a Gas Company and its customers.

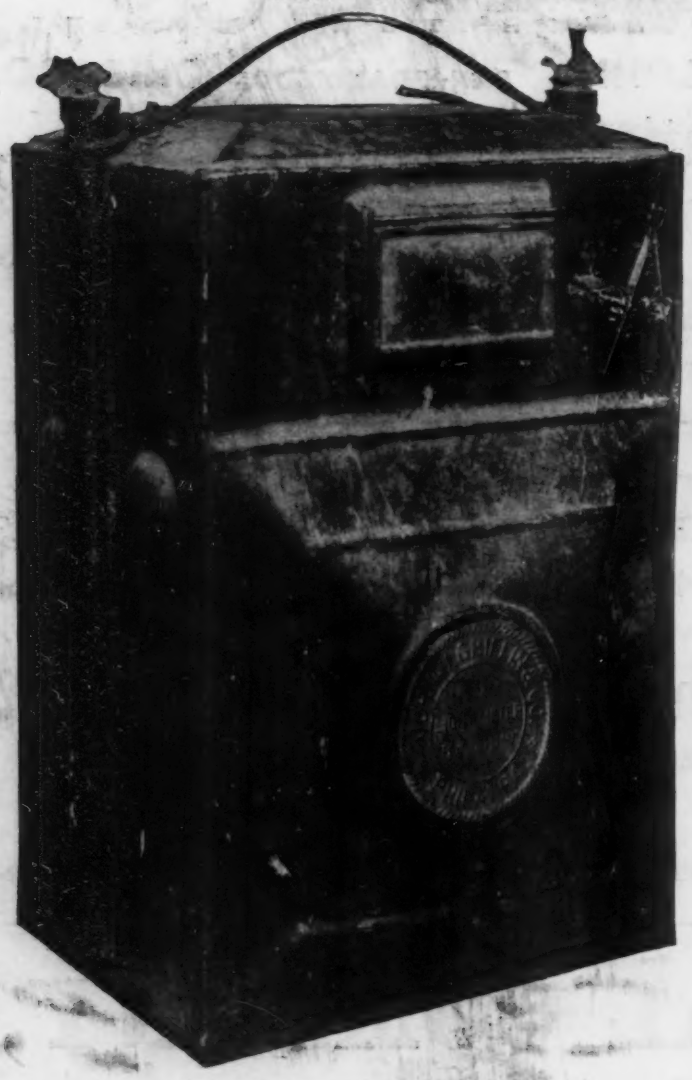
Yours truly, (Signed) F. C. SHERMAN, Superintendent.

A 28-page Pamphlet containing the cream of this Board's decisions as to the proper management of Gas Companies.

**Compiled by E. H. YORKE. Price $1.00. Address**

**A. M. CALLENDER & CO., - No. 42 Pine Street, New York.**

BEFORE.



This is a photograph of a 3-light regular meter out of a lot of meters received from the Coatesville Gas Co., Coatesville, Pa., to be repaired and converted into prepayment meters.

AFTER.

This is the same meter after it has been repaired and converted into a new prepayment meter.

**If you have some ordinary meters to be repaired, send them to us and let us repair and convert them into prepayment meters. They will be a source of satisfaction and profit to you.**

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